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ENVIRONMENTAL ASSESSMENT BOARD



ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 128

DATE: Monday, April 6, 1992

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act,
R.S.O. 1980, c. 140, as amended, and Regulations
thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro
consisting of a program in respect of activities
associated with meeting future electricity
requirements in Ontario.

Held on the 5th Floor, 2200
Yonge Street, Toronto, Ontario,
Monday, the 6th day of April,
1992, commencing at 10:00 a.m.

VOLUME 128

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

MR. M. HARPUR	Board Counsel
MR. R. NUNN	Counsel/Manager, Information Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator

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(Cont'd)

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H. POCH)	CITY OF TORONTO
J. PARKINSON)	
R. POWER		CITY OF TORONTO, SOUTH BRUCE ECONOMIC CORP.
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U. FRANKLIN)	FOR PEACE
B. CARR)	
F. MACKESY		ON HER OWN BEHALF
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M. BADER)	
B. TAYLOR)	MOOSONEE DEVELOPMENT AREA
D. HORNER)	BOARD AND CHAMBER OF
H. WATSON)	COMMERCE

A P P E A R A N C E S
(Cont'd)

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D. HAMER)	
C. FINDLAY)	
P.A. NYKANEN)	CANADIAN MANUFACTURERS ASSOCIATION - ONTARIO
G. MITCHELL		SOCIETY OF AECL PROFESSIONAL EMPLOYEES
S. GOUDGE		CUPE
D. COLBORNE		NIPIGON ABORIGINAL PEOPLES' ALLIANCE
R. CUYLER		ON HIS OWN BEHALF
L. BULLOCK		CANADIAN NUCLEAR ASSOCIATION

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1 ---Upon commencing at 10:02 a.m.

2 THE REGISTRAR: Please come to order.

3 This hearing is again in session. Please be seated.

4 THE CHAIRMAN: Mr. Mondrow?

5 MR. MONDROW: Good morning, Mr. Chairman.

6 I would just like to speak very quickly to two exhibits
7 to be filed on behalf of IPPSO. I have provided Mr.
8 Lucas with copies.

9 THE REGISTRAR: The first one has already
10 been given 570.

11 MR. MONDROW: And the first, as Mr. Lucas
12 has noted, has already been given an exhibit number,
13 570. It's entitled Four Items Concerning the
14 Regulation of Radioactive Emissions from Ontario Hydro
15 Nuclear Facilities. It will obviously be used by IPPSO
16 in cross-examination of Panel 9.

17 The second item is Ontario Hydro's
18 submission on 1993 electricity rates. I would ask that
19 it be given the next exhibit number, 571.

20 THE REGISTRAR: 571.

21 MR. MONDROW: It has been tabled by
22 Ontario Hydro at the Ontario Energy Board this year.
23 We will be relying on it briefly for Panel 9
24 cross-examination and likely more extensively for Panel
25 10 cross-examination, and we suspect some other

1 intervenors might be relying on it as well, and so we
2 would like to have it filed as an exhibit. Thank you.

3 ---EXHIBIT NO. 570: Document entitled Four Items
4 Concerning the Regulation of Radioactive
5 Emissions from Ontario Hydro Nuclear
6 Facilities.

7 ---EXHIBIT NO. 571: Ontario Hydro's submission on 1993
8 electricity rates.

9 MR. MONDROW: Oh, I should mention one
10 more thing for the record. We have been having a bit
11 of a problem with our photocopier. There were some
12 additional copies of both of these here this morning,
13 and I will endeavour to get more as soon as we can, and
14 we will leave them in the room.

15 Thank you.

16 THE CHAIRMAN: Thank you. Mr. Campbell?

17 MR. B. CAMPBELL: Mr. Chairman, Mr. Penn
18 has advised me that he wishes to make a correction with
19 respect to some information he was speaking to on
20 Thursday last. This has to do with the allocation of
21 the \$3.3 billion incremental interest cost for
22 Darlington and its categorization into plan schedule,
23 and so on, that he spoke to on Thursday, and I believe
24 he wishes to correct an answer that he gave, and I have
25 advised Mr. Bullock that he would be doing so.

THE CHAIRMAN: All right. Thank you.

Mr. Penn?

1 DAVID WHILLANS,
2 KURT JOHANSEN,
3 FRANK CALVIN KING,
 WILLIAM JOHN PENN,
 IAN NICHOL DALY; Resumed.

4 MR. PENN: I would like to refer, Mr.
5 Chairman, to Volume 127 of the transactions which was
6 last Thursday, April the 2nd, and on page 22360 Mr.
7 Bullock was questioning me at the time about Darlington
8 costs, and beginning on line 19 he said:

9 If there had just been the planned
10 delays so that 70 per cent of the net
11 figure, is that right, on Appendix 2 --
12 And my answer was:

13 Well, I think I have just answered
14 that question. It would be \$3.3 billion.

15 Now, when I was reviewing these
16 transactions this morning and thinking about this
17 subject with regard to Exhibit 539 and on the second
18 last page headed Appendix 5-1 there is a bar chart
19 which shows the historical cost increases in dollars of
20 the year from 1981 to 1992.

21 This bar chart, the first pillar to the
22 left is marked Schedule, and the \$3.3 billion that I
23 was referring to is the increased cost due to schedule
24 in total change from the definitive estimate issued in
25 1981.

1 So I wanted to make clear what that \$3.3
2 billion was.

3 THE CHAIRMAN: All right.

4 MR. B. CAMPBELL: Mr. Chairman, the only
5 other matter I have to raise is my friend from MEA
6 phoned me late Friday and said that certain materials
7 for cross-examination were on their way to my office at
8 that time. I was in my office until 6:00. I didn't
9 get them at that time, at which point I left.

10 The witnesses have been provided with
11 them this morning and were content to proceed on that
12 basis, but I just wanted it clear that if necessary
13 they may have to check information or so on because
14 they have not had the opportunity to review it over the
15 weekend.

16 THE CHAIRMAN: All right. Mr. Watson?

17 MR. R. WATSON: Thank you, Mr. Chairman.

18 I would like to thank Mr. Bullock for
19 cooperating and allowing me to go ahead of him this
20 morning.

21 The first order of business is to get an
22 exhibit number for the materials that I will be relying
23 on. I have provided these to Mr. Lucas.

24 THE REGISTRAR: It will be 572, Mr.
25 Chairman.

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1 Hydro was now planning on life extending two coal
2 stations.

3 From my review of the Panel 9 evidence it
4 appears as though Hydro recognizes life extension as an
5 option, as a possibility. Hydro has had a program
6 which has a goal of preserving the life extension
7 option, studies are under way with respect to life
8 extension, and I understand that a decision will be
9 made at some future time when the studies are complete.

10 Now, keeping those facts in mind it
11 appears to me that Hydro has adopted, if you will, a
12 middle ground between their position on Panel 2 and
13 their position on Panel 8 with respect to nuclear plant
14 life extension; is that fair?

15 MR. PENN: A. Well, we haven't made any
16 change to the present depreciated life of nuclear plant
17 in this province. It has been 40 years' life from a
18 depreciation point of view, in my knowledge, for the
19 last eight years.

20 Q. Yes, I am aware of that, Mr. Penn. I
21 am just trying to understand the corporate philosophy,
22 if you will, and it seems as though we have had two
23 contrasting philosophies to date. In Panel 2 and Panel
24 8.

25 My understanding of Panel 9 is it is

1 somewhere in between those two, and I am trying to get
2 a handle on that. Would you agree that Panel 9 is
3 trying to adopt a middle ground, if you will, between
4 these two competing philosophies?

5 A. I wouldn't characterize it as a
6 middle ground. I wasn't privy to discuss with relation
7 to the two fossil stations that you mentioned, but I
8 was privy to meetings with regard to the service life
9 of nuclear plant, and indeed, I was responsible in the
10 first place for recommending at the Ontario Energy
11 Board what the life of nuclear plants should be from a
12 depreciation point of view.

13 We haven't changed our position because
14 we don't have new knowledge at this time on nuclear
15 plant to change from that life. So I don't think we
16 have taken a middle ground. I think our position is as
17 it has always been.

18 Q. I guess I am just trying to
19 understand what your position has been on nuclear life
20 extension. Are you saying that it is the same as the
21 position taken by Hydro in Panel 2, that at this time
22 it is risky, a gamble, it is not prudent?

23 A. My position is that we have
24 insufficient experience in operating nuclear plant and
25 that there are certain issues that need to be

1 determined in the course of time before it is prudent
2 to make any change to the life of our nuclear plant.

3 Q. Mr. Penn, you would agree that you
4 are not going as far as Hydro has gone in Panel 8. You
5 are not planning on life extending any nuclear stations
6 at this point?

7 A. We are not planning at this point in
8 time. We are very mindful of the value to the province
9 of gaining the most from our assets, and, therefore,
10 operating them reliably and safely for as long as
11 possible.

12 But at this point in time our nuclear is
13 as I have said before, there is just insufficient
14 information to confidently extend and support further
15 life of nuclear plant beyond 40 years.

16 [10:14 a.m.]

17 Q. Mr. Penn, I understand all that. My
18 question to you was that Hydro is not currently
19 planning on life extending any plants, they have not
20 made a decision in that respect; is that correct?

21 A. They certainly haven't made any
22 decision on nuclear plant.

23 Q. Right.

24 A. It is my understanding that the
25 Update does suggest life extension of fossil plant.

1 But, as I say, I don't know the basis of that.

2 Q. Well, that's certainly my
3 understanding Mr. Penn as well. So in that regard,
4 Hydro has not gone as far with nuclear life extension
5 as they have with fossil life extension; have they?

6 A. No it hasn't, no.

7 Q. On the other hand, they have
8 implemented studies to look at life extension, they
9 have a program, the Nuclear Plant Life Assurance
10 Program - which we will get into in more detail later -
11 which has a goal of preserving the life extension
12 option.

13 So I suggest to you they have gone a
14 little further than what Hydro suggested in Panel 2.

15 A. Well, I think it would be fair to say
16 that we are paving the way for a possible decision if
17 future observations and knowledge confidently
18 demonstrates that life extension is economic and
19 reliable and safe. So we are paving the way for that
20 possibility.

21 Q. Okay. Mr. Penn or Mr. Daly, and I
22 imagine most of my questions will be directed to you
23 two gentlemen.

24 If you could look at Exhibit 572 which is
25 the material I provided you, page 1 is a copy of

1 Interrogatory 2.6.16 and, Mr. Chairman, I understand it
2 already has a number of 475.14, that's from Panel 8.

3 Would you care to give it another number
4 for Panel 9?

5 THE CHAIRMAN: I think it also should be
6 given a Panel 9 number as well. 520...?

7 THE REGISTRAR: That will be 520.45.

8 THE CHAIRMAN: Thank you.

9 ---EXHIBIT NO. 520.45: Interrogatory No. 2.6.16.

10 MR. R. WATSON: Q. And very quickly, Mr.
11 Penn, you will note that that interrogatory is dealing
12 with life of existing generating plants, and the first
13 sentence of the answer states:

14 There are no studies regarding
15 extending the lives of existing fossil
16 and nuclear generating stations beyond
17 their expected service lives.

18 That interrogatory answer was dated March
19 5th, 1991. I assume that is still correct today with
20 respect to the nuclear stations; is that true?

21 MR. PENN: A. Well, unless Mr. Daly can
22 help me here, I am not familiar with the detail of
23 current studies on extending the life of nuclear plant.

24 Q. Perhaps I could ask Mr. Daly if you
25 are not familiar with it, Mr. Penn.

1 MR. DALY: A. Certainly we have and I
2 you have attached it in the next interrogatory 9.9.37
3 and I did mention it in my direct evidence.

4 We have a nuclear plant life assurance
5 program which has two objectives and the primary
6 objective is to assure that we get the 40-year life, so
7 our primary focus on this program to date has been
8 assuring we get the life and, at the same time,
9 maintaining the option of life extension.

10 I think it's still quite correct to say
11 that we have no formal plans or informal plans at this
12 stage to actually extend the lives beyond the 40 years.

13 The study is to maintain the option open
14 and that is as far as we have gone at this stage.

15 Q. So the answer is still correct, there
16 are no studies?

17 A. There are no studies beyond the
18 nuclear plant life assurance program which looks to
19 maintaining the option available.

20 Q. Mr. Daly, when the Update was being
21 prepared, were you approached to give any consideration
22 to life extending the nuclear plants?

23 A. Yes, I was. I was involved in some
24 of the discussions and I confirm what Mr. Penn has
25 already said, that it was felt that at this point in

1 time we hadn't gone far enough with the studies in
2 nuclear to be able to commit to any life extension, we
3 just simply hadn't done enough work.

4 Q. I am interested in those discussions
5 which occurred with respect to the Update. Could you
6 tell me who was involved in those discussions and could
7 you tell me who made the decision not to consider
8 nuclear life extension in the Update?

9 MR. PENN: A. Well, as I mentioned
10 earlier, I was also involved in these discussions. I
11 don't remember all the people at that small meeting,
12 but Mr. Taborek chaired the meeting. Do you recall who
13 else was there?

14 MR. DALY: A. Mr. Andreeff I believe was
15 there representing operations. I expect there were two
16 or three other operations people at that particular
17 meeting. So the operations design and system planning.

18 MR. PENN: A. System planning requested
19 the meeting in order to consider the matter and I knew
20 at the same time that similar meetings were going on
21 with regard to fossil but I wasn't involved in them.

22 Q. But you were involved with nuclear?

23 A. Yes, I was.

24 Q. Was it this group that made the
25 decision that nuclear life extension would not be in

1 the Update?

2 A. Yes, it was.

3 Q. In looking at Hydro documents, I have
4 noticed that a number of times decisions are made,
5 reports are issued and those reports are reviewed by
6 people and approved by people. Was there any written
7 report with respect to these discussions and this
8 decision?

9 A. There was no report issued, no.

10 Q. Was this decision approved by anyone
11 higher up the line?

12 A. I am afraid I can't tell you that.
13 It depends how high you want to go up on the line. It
14 was approved at my level as group manager, whether it
15 was reviewed by a director or vice-president, I can't
16 tell you.

17 THE REGISTRAR: Mr. Chairman, the
18 interrogatory that Mr. Daly gave 9.9.77, is that to be
19 given a number?

20 MR. DALY: Sorry, the number was 9.9.37.

21 THE REGISTRAR: 37?

22 MR. DALY: Yes.

23 THE REGISTRAR: Thank you. That's
24 already entered.

25 MR. R. WATSON: Mr. Chairman, I would

1 like to go to that interrogatory now, please, and deal
2 a little bit, Mr. Daly, with the nuclear plant life
3 assurance program.

4 Q. I understand from your evidence that
5 one of the two objectives of the nuclear plant life
6 assurance program is to preserve the nuclear life
7 extension option?

8 MR. DALY: A. That's correct.

9 Q. And in looking at life extension in
10 some of Hydro's documents I notice that Hydro has been
11 interested in nuclear life extension for some time.

12 I believe there was a paper written by
13 Mr. Chadha, C-h-a-d-h-a, and it's entitled: Assessment
14 of Plant Life Extension (PLEX) and Long-Term
15 Reliability Assurance (LTRA) Issues for Ontario Hydro's
16 Nuclear Generating Stations.

17 Are you familiar with that paper, Mr.
18 Daly?

19 A. I am familiar with the majority of
20 Mr. Chadha's papers, I guess generally written around
21 '88, '89.

22 Q. I believe this one was issued in
23 February of 1987.

24 A. Okay.

25 Q. It is report No. CNS-IR-09700-1. And

1 you would be familiar with that paper?

2 A. Yes. Mr. Chadha at that time was
3 attached to our department and he initiated some of the
4 work on nuclear plant life assurance, so these were
5 some of the earliest reports on the topic.

6 Q. In fact, when Mr. Heintzman
7 introduced the nuclear plant life assurance program, he
8 referred to an article written by Mr. Chadha?

9 A. Correct.

10 Q. And that is entitled: Canadian
11 Programs for Understanding and Managing Nuclear Power
12 Plant Aging Degradation.

13 A. Yes, I recall that.

14 Q. And also while we are on Mr. Chadha,
15 we will get to this in a few minutes, but attached to
16 9.9.37 was a report dealing with plant life assurance,
17 scoping study for Pickering "A". Mr. Chadha was
18 involved with that too; wasn't he?

19 [10:25 a.m.]

20 A. He wasn't an author, but he was
21 certainly involved in participating in the work that
22 led to the production of that report, yes.

23 Q. Yes. So certainly Ontario Hydro
24 through Mr. Chadha has been looking at life extension
25 from at least 1987 and probably earlier, considering

1 Mr. Chadha probably had to do some research before he
2 issued his paper?

3 A. I think, as I said earlier, the
4 primary focus was the life assurance aspect, and of the
5 two program objectives the life assurance and getting
6 to 40 years first of all has been very much the primary
7 focus of the program to date.

8 The secondary objective of maintaining
9 the option open has been just that, a secondary option
10 for the time being.

11 Q. Yes, but still an important option?

12 A. An important option, but we have to
13 recognize that we have to go through another 20 years
14 before we are at the life extension point. So that is
15 perhaps why we are not making commitments at this time,
16 that there is a large number of years still ahead of
17 us.

18 Q. If you would keep that thought, Mr.
19 Daly, we are 20 years to the life extension point. I
20 want to deal with that later, but if we could continue
21 with Interrogatory 9.9.37.

22 If you look at page 2, which is the
23 question that is asking for detailed descriptions of
24 the major components at existing nuclear stations, and
25 then at page 3 -- and that is of my exhibit, 572.

1 If you look at page 3 you will see the
2 response to Interrogatory 9.9.37, which describes the
3 nuclear plant life assurance program, and you can see
4 in the first paragraph that the program has three
5 phases: define methodology, scoping and
6 implementation. And you notice in the second paragraph
7 that the definition of methodology is complete.

8 Then the third paragraph refers to the
9 scoping phase and indicates it is summarized in the
10 attached flow chart.

11 The fourth paragraph indicates that Hydro
12 is about halfway through the scoping phase.

13 Now, if we could just turn the page to
14 page 4 of Exhibit 572, which is the flow chart for the
15 scoping phase which was referred to in the third
16 paragraph of the interrogatory answer I just read, Mr.
17 Daly, if you could help me with this scoping phase?

18 In keeping with the two main objectives
19 of the nuclear plant life assurance program I looked
20 through this and I did not see plant life extension
21 mentioned in this flow chart. Is it subsumed in one of
22 these boxes or several of the boxes?

23 A. I think really what is assumed here
24 is that the degradation mechanisms apply equally to the
25 life assurance phase, i.e. getting to 40 years, and

1 would apply equally and perhaps even more so beyond the
2 year 40.

3 So I think this is a process you have to
4 go through both to get to 40 years and beyond. So I
5 think it is consistent, the process is consistent with
6 both the objectives of the program.

7 I think clearly in the later stages of
8 plant life, you know, you may potentially turn up some
9 additional degradation mechanisms or experience some
10 additional equipment problems which you would want to
11 look at before you confirmed that you are going ahead
12 with life extension.

13 But I think the basic approach applies
14 equally.

15 Q. My concern, Mr. Daly, is that if it
16 isn't specifically mentioned and if it doesn't seem to
17 have a niche, I am concerned that you may not be
18 meeting your goal of preserving the life extension
19 option. I am concerned that there isn't the attention
20 being devoted to this.

21 A. Well, certainly we feel within the
22 program we are adequately addressing and maintaining
23 the option.

24 We are collecting records and history on
25 the basis that we may at some point in the future wish

1 to life extend, and we want to make sure that we have
2 collected the information that will allow to us do so
3 should we choose to do so at that particular point in
4 time.

5 Q. Well, Mr. Daly, you mentioned
6 degradation. I note in looking at the flow chart there
7 is a box, a decision box, that has contains the words
8 "rate of degradation acceptable". It is in the middle
9 near the bottom of the flow chart. Do you have that?

10 A. On the left-hand side?

11 Q. No, in the middle.

12 A. Oh, sorry. Yes.

13 Q. The one on the left-hand side said
14 "degradation rate known"?

15 A. Right.

16 Q. If you just continue along that line
17 it is the fourth decision box along from the left. It
18 says "rate of degradation acceptable"?

19 A. Yes, I have that.

20 Q. That is what you were referring to
21 when you were talking about degradation?

22 A. Yes.

23 Q. I notice flowing out of that decision
24 box you go to a box that contains the words "mitigation
25 possible", and then flowing out of that box you go to

1 another one that says "repair desirable or possible".

2 A. Yes.

3 Q. And those decision boxes lead down to
4 possible decisions such as developing methods of
5 mitigation, develop repair or replacement programs,
6 redesign or reanalyze.

7 When I was looking at this, Mr. Daly, it
8 seemed to me that a decision to repair or decision to
9 mitigate would be a function of whether you wanted a
10 40-year life or whether you wanted a longer life, isn't
11 that true, because aren't you then getting into the
12 technical feasibility and the economic feasibility of
13 these very decisions that you have elaborated upon,
14 that you have illustrated here?

15 A. I guess that is possible. I think
16 that the typical decision we have been faced with up to
17 this point in time are decisions that we have to make
18 in terms of pressure tubes or steam generators, and
19 they are generally, in the case of pressure tubes,
20 fairly clear cut to replace the pressure tubes.

21 Now, I agree that pressure tubes
22 obviously there will come a point in time some 25, 30
23 years from now where we will be faced with that type of
24 decision on pressure tubes, but I guess your question
25 is feasible. I don't recall running into that

1 particular problem to date.

2 Q. Well, Mr. Daly, if it is an issue,
3 then I am not sure I understand how you are resolving
4 that issue if one of your goals is to preserve the life
5 extension option.

6 A. I can't off hand think of anything we
7 have faced yet where we would have made a different
8 decision, quite frankly.

9 Q. Well, we are not talking so much
10 about specific decisions as we are talking about your
11 goals and your approaches?

12 Now, if in fact you are concentrating on
13 a 40-year service life and you need to look at
14 technical issues and economic issues when repair and
15 mitigation comes about, then how are we assured that
16 you are fulfilling your goal of preserving the life
17 extension option?

18 A. Well, because the second objective of
19 the program is to maintain the option open.

20 What I am saying is we would not make a
21 decision which would eliminate that option. In other
22 words, we would not take a decision to make a repair
23 which would only last to year 40 and then economic
24 operation beyond that time would not be feasible. We
25 are conscious of that in making decisions. So our

1 decisions are being made in the light of making sure we
2 get to 40 years and maintaining the options open.

3 Q. So what you are saying is, not
4 looking at it from a unit or a station perspective but
5 looking at it from a component perspective, when you
6 are looking at these decisions you are making decisions
7 to ensure that you meet your goal of preserving the
8 life extension option?

9 A. That's correct. And that is the
10 objectives of this whole nuclear plant life assurance
11 program in that the program is a kind of oversight,
12 overview program, if you like, and as we go through and
13 scope out the different pieces of equipment we are in
14 effect asking ourselves these questions: Are there any
15 unanticipated degradations? Are we doing the right
16 sort of things to maintain the option open?

17 And if we find on this oversight or
18 overview that we are not doing these things we adjust
19 our programs as we go along.

20 So I think in effect we are asking
21 ourselves the question you have just asked as we go
22 through this scoping phase. That is the purpose of the
23 scoping phase, to ask that type of question and make
24 sure that you are not doing something which in effect
25 eliminates the option of life extension.

1 Q. Mr. Daly, attached to the same
2 interrogatory, 9.9.37, is a report entitled Nuclear
3 Plant Life Assurance, Scoping Study, Pickering "A", and
4 that study was prepared by Mr. Anderson and verified by
5 I.N. Daly. I assume that is you, Mr. Daly?

6 A. It is.

7 Q. Mr. Daly, I have produced two pages
8 of that study, and I am going to refer to only those
9 two pages. Needless to say, if there are other pages
10 that you feel are important to explain answers to the
11 questions I pose please bring them to the Board's
12 attention.

13 If you look at page 5 of my exhibit you
14 will see table 1.1 from that interrogatory.

15 In looking at that table, which is
16 entitled NPLA Program Schedule, I notice that it is
17 divided into the three phases that we have already
18 discussed: the methodology phase, the scoping phase,
19 and the implementation phase.

20 I was particularly interested in Phase 2,
21 number 5 for a number of reasons, the first of which
22 was that number 5 reads: Monitor international
23 developments related to PLEX life extension and NPLA,
24 nuclear plant life assurance programs.

25 Now, in looking at the rest of that table

1 that was the only reference I saw to life extension.
2 Is there any other reference that you can see? And
3 that is only a reference with respect to monitoring.

4 A. It is the only reference in that
5 table.

6 PLEX was a name given to this program I
7 believe in the U.S., and we felt that the Nuclear Plant
8 Life Assurance was a better title for the program,
9 given where we are in Ontario. For the present time we
10 thought it was most appropriate to focus primarily on
11 life assurance until the plants were slightly older and
12 we were potentially into a life extension phase.

13 Q. So your evidence is that when you
14 refer to PLEX there you are not referring to Hydro
15 initiatives; you are referring to those outside of
16 Ontario Hydro, and NPLA is in effect Hydro's PLEX
17 initiative?

18 A. Well, PLEX, as I understand it,
19 stands for Plant Life Extension, and our program has,
20 as I said, two objectives, and the first objective is
21 to get to the 40 years, and that is what is primarily
22 consuming us at the present time. And obviously, you
23 have to get there first before you can extend life.

24 Q. Yes.

25 A. So we wanted to put our focus first

1 of all on that part of the program.

2 Q. But just so I understand your
3 evidence, when you are referring to PLEX you are not
4 referring to Hydro's initiatives; you are referring to
5 those outside Hydro?

6 A. Correct. Yes.

7 Q. And Hydro's PLEX initiatives -- and I
8 am not saying you have made a decision, but your work
9 in that area is in the NPLA program?

10 A. That's correct, yes. Yes.

11 Q. So you don't refer to it as PLEX; you
12 refer to it as NPLA.

13 A. No, that was a reference to other
14 utilities, other countries.

15 Q. Okay. In looking at Phase 1, No. 2
16 and No. 4, in No. 2 it talks about finalizing the
17 general NPLA methodology; No. 4 it talks about defining
18 general direction, structure, and preliminary schedule
19 for the NPLA program.

20 [10:38 a.m.]

21 My client is concerned that Hydro
22 specifically referred to the goal of life extension in
23 dealing with the methodology phase, and it is your
24 evidence that in fact in dealing with the methodology,
25 in coming to a decision on the methodology, life

1 extension was a significant part of the final product.

2 A. It is the second objective of the
3 program, yes.

4 Q. The same thing with Phase 2 where you
5 go through No. 2, defining the scope of the initial
6 NPLA initiatives; 3, grouping these initiatives; and,
7 4, preparing cost estimates.

8 Again life extension is a significant
9 part of all of these subsets of a scoping phase?

10 A. Yes, Mr. Watson, it's an important
11 point. We don't want to do something that will
12 preclude the option of life extension. That would
13 clearly not be in our best interests.

14 Q. Now, Mr. Daly, I understand your
15 evidence or the panel's evidence to be that you cannot
16 determine the technical feasibility of life extension
17 and you cannot do a cost/benefit analysis with respect
18 to life extension at this time; is that fair?

19 A. Well, we certainly have not
20 completely finished the technical assessment and I
21 think basically, as I understand it, the technical
22 assessment really has to come first. So we are some
23 ways along but we have not completed that technical
24 assessment yet.

25 Q. Now, Mr. Daly, if you would refer to

1 page No. 7 of my exhibit and continuing from page 7
2 through to page 13 we have the title page, the table of
3 contents, and the first five pages of a study entitled
4 Monticello Nuclear Generation Plant, Plant Life
5 Extension Program, Cost/benefit Analysis Report, and
6 you will note that this was done in January of 1987.

7 In your evidence you referred to the
8 Monticello nuclear station which is operated by the
9 Northern States Power Company I believe.

10 A. Correct.

11 Q. And my understanding is that
12 Monticello's operating licence expires around the year
13 2007; is that fair?

14 A. Subject to check, I believe it would
15 be around that time, yes.

16 Q. Okay. So it's been on line since the
17 late 60s, early 70s, something like that?

18 A. I believe that's correct, yes.

19 Q. I assume that you are somewhat
20 familiar with the Monticello situation as you refer to
21 it in your evidence; is that fair, Mr. Daly?

22 A. I am somewhat familiar with it. When
23 we got into our program, we became aware that
24 Monticello was the lead unit or one of the lead units
25 in this type of study in the States and we had some

1 contacts with them to find out the details of their
2 program and it did influence the development of our
3 program.

4 Q. Okay. If you look at page 11 of my
5 material, Mr. Daly, at the top of the page is a
6 sentence which reads:

7 This base case indicates that a
8 positive net present value would be
9 achieved within the first five years of
10 the life extension period.

11 Then if you follow down the page, under
12 the heading Introduction, the second sentence reads:

13 From a technical viewpoint,
14 Monticello's life extension for a 30-year
15 period has been shown to be feasible.
16 The economic analysis, therefore, extends
17 through the year 2040, some 54 years from
18 the present.

19 And my client's concern, Mr. Daly, is -
20 and as you saw, this report is dated 1987 - if
21 Monticello can be in a position to make an economic
22 analysis and a technical analysis five years ago, why
23 can't Hydro do the same thing?

24 A. Well, I think Hydro is working
25 towards that end. There are differences between the

1 CANDUs and the PWRs as you know.

2 One factor we would have to look at
3 seriously, of course, would be the effect of retubing.
4 We have replaced the pressure tubes in a number of
5 reactors, they are expected to last for 25, 30 years.
6 Clearly at some point in time towards the end of life
7 there is the potential for a second retube. We would
8 have to assess, you know, the economics and the
9 technical possibility of that.

10 So there are some differences between
11 PWRs and CANDUs that we will have to take into
12 consideration in making our decision.

13 Q. No question, Mr. Daly. And PWRs have
14 some difficulties that CANDUs don't have?

15 A. That's true.

16 Q. Concern about neutron bombardment of
17 the pressure vessel, for instance.

18 A. Yes.

19 Q. Those are things you don't have to
20 worry about. They have their own difficulties, yet
21 they are able to make some decisions on life extension.

22 A. I think --

23 MR. B. CAMPBELL: Just a minute. I don't
24 see anything in this that indicates that a decision has
25 been taken on that discussion.

1 MR. R. WATSON: Q. Let me rephrase the
2 question, Mr. Daly. They are able to produce a report
3 which indicates that from a technical point of view
4 life extension for 30 years is feasible and they have
5 also been able to do an economic analysis in 1987 which
6 is at about the - assuming a 1970 in-service life -
7 about a 17 year anniversary of the in-service.

8 That's reasonably early in the unit's
9 life. So, as I said, my client's concern is why can
10 they do it and we can't.

11 MR. PENN: A. I think I would like to
12 make a comment to put this study in context. The
13 Northern States Power Company hired a consultant named
14 Multiple Dynamics Corporation in - presumably 1986 - to
15 do a preliminary review of the possibility of life
16 extension, and that's a long way from making a decision
17 to have life extension.

18 And when Mr. Daly and I were recently in
19 Palo Alto speaking with the Electric Power Research
20 Institute, that you can note on this document
21 cooperated with, obviously one of their sister
22 utilities, we were informed that the Northern States
23 Power Company was just assembling currently information
24 in order to present their position to the U.S. Nuclear
25 Regulatory Commission, and I can assure you that such a

1 review of the extension would go on by the USNRC for
2 quite some considerable time.

3 Then, undoubtedly in the United States,
4 within their regulation, there would be a public
5 hearing into the feasibility of appropriateness of such
6 an extension. So we are a long way - and this is the
7 first utility in the United States that is making these
8 moves - so we are a long way, Mr. Watson, from a
9 decision. They are seriously considering to the
10 advantage of their customers the provision for
11 extension.

12 Q. No question, Mr. Penn, and your
13 evidence previously has been clear to that effect, that
14 Monticello had to go through regulatory hearings, but
15 with respect, that is really not what we are dealing
16 with here. We are not dealing with whether there has
17 been approval granted to go ahead with life extension,
18 we are talking about the start of the process, if you
19 will.

20 In this situation a study has been done
21 about 17 years into the operating life of a station, a
22 decision has been made at the utility with respect to
23 the technical feasibility and the economic feasibility
24 and, as you quite correctly point out, that is going to
25 be subject to some review, probably considerable

1 review. My point is: Why aren't we at the same stage?

2 A. Well, I'm not quite sure that we need
3 to be at the same stage. In the United States they
4 have just introduced - I should back off and say it may
5 be 18 months ago - introduced a new regulation in the
6 United States Nuclear Regulatory Commission that
7 provides guidelines and tests and requirements to be
8 met by the proponent, the utility, in order for life
9 extension to be considered.

10 We haven't got similar legislation, to my
11 knowledge, in this country that necessitates that
12 process. EPRI advised me when I was there this January
13 in Palo Alto that this process in the United States
14 could take upwards of 10 years, and that is the reason
15 why certain utilities in the United States are making
16 earlier endeavours in order to pave the way.

17 Now, we don't see at this point in time a
18 need for us to plan for 10 years ahead with regard to a
19 decision process, but we do see a need to be perfectly
20 up to date on the total condition of our plant and, in
21 particular, the key components that will, as you quite
22 rightly point out, from an economic point of view and
23 safety point of view cause a decision for life
24 extension to be made when it's appropriate to do so.

25 Q. Mr. Daly or Mr. Penn, have you spoken

1 with the people at Monticello with respect to this
2 study or others in regard to life extension?

3 MR. DALY: A. I have not personally, but
4 I was involved in this program until about early 1989
5 and the person who took over the program at that time
6 has spoken to Monticello and, as I said, some of the
7 techniques and the approach has been built into our
8 program.

9 I might also add as a further comment to
10 Mr. Penn's remarks that when we were having discussions
11 with EPRI, they indicated that plant life extension
12 decisions would probably be made between years 20 and
13 35 in the States, so Monticello is clearly at the
14 leading edge there, probably not even at year 20. So
15 that would indicate...

16 Q. I would like to deal with that
17 factor, if I could, Mr. Daly. In looking at
18 international practice, Mr. Heintzman referred you to
19 the excerpt from Mr. Chadha's paper which indicated
20 that the NPLA methodology was based on international
21 practice, and you would agree with that?

22 A. Yes.

23 Q. And if you could turn to page 14 of
24 Exhibit 572, please, you will see the first two pages
25 of an article entitled: Nuclear Life Extension Pays

1 But The Commitment Starts Today.

2 MR. R. WATSON: And, Mr. Chairman, that
3 is an article in the magazine entitled: Electrical
4 World in February of 1988.

5 Q. Mr. Daly, I would like to refer you
6 to the table at the top of page 15 and, first of all, I
7 note up in the top right-hand corner, in reasonably
8 small print, it says:

9 Data from Babcock and Wilcox,
10 A Comprehensive Plan for Life Assurance
11 and Life Extension.

12 And Babcock and Wilcox are quite well
13 recognized in the nuclear field?

14 MR. DALY: A. Yes.

15 Q. And if you look at this table, Mr.
16 Daly, you will see that on the left-hand side are a
17 series of activities and the first one is establish
18 management approach to life extension.

19 Now, if you look at the right-hand side
20 of the graph you will see a series of bars extending
21 horizontally and at the bottom of that table you will
22 see the line which says, years from original licence,
23 and the first is 16 and it extends all the way through
24 to 60. Are you with me, Mr. Daly?

25 A. Yes.

1 Q. If you look at the intersection of
2 the graphs with the activity area, you will notice that
3 there are six bars that start at the year 16; they are
4 establish management approach to extension, evaluate
5 technical feasibility of life extension, cost benefit
6 to extend life, O&M practices to extend life of
7 critical elements, monitoring and recordkeeping
8 practices for critical elements; and, finally, life
9 cycle management of plant hardware.

10 The first thing, Mr. Daly, I notice the
11 figure 16 years, that appears to be consistent with
12 what Monticello is doing; isn't that fair?

13 A. I think it is also reasonably
14 consistent with what we have been doing. You made
15 reference to Mr. Chadha's report in 1987, which was
16 just 16 years after Pickering started up, so I think
17 our management approach was being put in place at
18 approximately the same time.

19 [10:55 a.m.]

20 Q. So looking at the first three they
21 start at year 16, so your evidence is that those three
22 are now in place at Hydro. In looking at the time
23 frames those are very short time frames.

24 A. No, I was referring to the first
25 item, establish the approach to life extension, and, as

1 I have indicated, maintaining the option of life
2 extension was one of the two objectives of the NPLA
3 program.

4 We have not completed the full technical
5 feasibility assessment of life extension. As I
6 indicated earlier, we have been concentrating on what
7 we see as the important first phase of the program,
8 getting to the 40 years.

9 Q. Or the cost/benefit?

10 A. Correct.

11 Q. Okay. Now, moving down to the next
12 three, O&M practices to extend life of critical
13 elements, are those in place at this time or are you
14 studying whether they should be put in place?

15 A. We are really focusing on primarily
16 getting to the 40 years. As you know, we have been
17 engaged in major rehabilitation and upgrading work at
18 Pickering in parallel with retubing, and many of our
19 efforts went into that program as indicated in the
20 earlier interrogatory, 9.9.37.

21 So many of the activities associated with
22 retubing and rehabilitation in fact support the
23 objectives of the NPLA program. Similarly for the
24 Bruce "A" station, which is entering a program of
25 retubing and rehabilitation starting in '94, many of

1 the things we will be doing during that program support
2 both the objectives of the NPLA program.

3 So we have been faced with major
4 retubings in mid-life which have in effect given us the
5 opportunity to do a number of the things which are
6 indicated on this flow chart.

7 Q. So the main activity you are involved
8 in right now is the NPLA, and your evidence is that
9 that does not deal with all six of these items?

10 A. I wouldn't put it quite like that.
11 We are at the NPLA program. We have already indicated
12 the two objectives of the program, and we are
13 concentrating at this stage more on getting the 40
14 years, getting the retubing complete, getting the
15 concurrent rehabilitation complete.

16 So, you know, your first focus has to be
17 on the next 20 years, and we have to think beyond that
18 but that is where we are at this point in time.

19 Q. Well, I guess that is the point of
20 this article, isn't it, Mr. Daly? You are saying the
21 first focus is getting the life.

22 This article is saying and this chart is
23 telling you if you want to do life extension, if you
24 want to consider it seriously, there are very serious
25 activities here, these six that we have been dealing

1 with, that have to be implemented very early in a
2 unit's life?

3 A. We agree with that. It is just that
4 our timetable appears to be slightly different from the
5 timetable shown in here. I would argue that it is not
6 greatly different.

7 As you see, we established a management
8 approach at approximately the same point in time, so I
9 would argue that Monticello is clearly the lead station
10 in the States, and each utility has its different
11 priorities and objectives. I think ours are
12 appropriate, given Ontario Hydro's current situation.

13 Q. Well, Mr. Daly, my client's concern
14 here is that, isn't it possible that you would be doing
15 something different with respect to nuclear O&M if you
16 had already performed the technical feasibility
17 analysis with respect to life extension as well as a
18 cost/benefit analysis in keeping with the graph that we
19 have seen here?

20 A. I don't think so. I think in looking
21 at what you need to carry you through for the next 20
22 years you are looking at virtually everything you need
23 to life extend, so...

24 Q. Mr. Daly, isn't it true that one of
25 the reasons you want to make life extension decisions

1 earlier in a unit's life rather than later is that by
2 making this decision early on you may avoid the
3 possibility of an expensive rehabilitation which would
4 be associated with a later plant life extension
5 decision?

6 A. Well, we are already faced with
7 rehabilitation programs because of the opportunity we
8 have while the retubings are going on. We are taking
9 that opportunity to do a mid-life rehabilitation.

10 We certainly don't want to be faced with
11 making the decision too late in life, but I think
12 making it too early has equal drawbacks.

13 If you make a decision at year 20, you
14 know, it is conceivable that you could, you know, find
15 something occurring between years 25 and 30, say, that
16 would negate that decision.

17 So, you know, these decisions can be made
18 too early and too late, and obviously, we want to avoid
19 doing either.

20 Q. Mr. Daly, you mentioned earlier that
21 you were 20 years to the PLEX point, and as I
22 understand it, what you meant was you were 20 years to
23 making a decision on life extension.

24 A. Well, for Pickering "A", yes.
25 Pickering "A" is about 20, 21 years old.

1 Q. Yes.

2 A. So we are 20 years from the end of
3 life. I don't think I said we were 20 years from
4 making a decision point.

5 Q. Okay. I just wanted to clear that
6 up.

7 A. No.

8 Q. And the reason is I want to get some
9 handle on when this was done. Clearly, you don't make
10 a decision on life extension in year 39.

11 A. Correct. Yes.

12 Q. These articles and the Monticello
13 experience are suggesting that you make a decision
14 around year 16, before year 20.

15 Now, it seems to me that there is great
16 scope there. I mean, where should the decision be made
17 on Ontario Hydro's --

18 MR. B. CAMPBELL: Mr. Chairman, hasn't
19 the witness -- both witnesses have addressed this
20 question about three times each now, and they have both
21 said that the range for making that decision is in the
22 year-20-to-year-35 range and that Monticello is the
23 lead unit. Isn't that the evidence, not that it is
24 made at year 20? I think this question has been
25 answered about five times by my notes.

1 MR. R. WATSON: Mr. Chairman, with
2 respect, there is no question that the witnesses have
3 given us a range of 15 years. I am trying to get a
4 little more clarity if possible. 15 years in a 40-year
5 life is not particularly helpful, especially when we
6 are dealing with a planning exercise that is 25 years.

7 My question to the --

8 THE CHAIRMAN: Isn't that really
9 argumentative?

10 They have said that this NPLA program is
11 involved in both making sure that the nuclear stations
12 achieve their planned life and maintaining the option
13 for further life if that is feasible to do.

14 You may disagree with their time frames
15 and that, and that may be a matter for argument, but
16 this is what they are doing.

17 You are not going to get much more than
18 that, are you?

19 MR. R. WATSON: I am not sure I can
20 answer that question, Mr. Chairman.

21 I was wondering if they could be -- I
22 don't think this question in fairness has been put to
23 them.

24 They have given a range of 15 years. My
25 simple question is: Can they give us any better

1 estimate than a range of 15 years? Is there a median
2 in that range? I understand that 35 is the upper part
3 of the range and I understand that 20 is the lower part
4 of the range. Is there a median in that range?

5 THE CHAIRMAN: I don't know, for example,
6 because I haven't read the NPLA documentation, but is
7 there a critical path such as the Babcock & Wilcox
8 critical path which is set out for the NPLA and further
9 on. Is there that kind of critical path? I don't
10 know.

11 MR. R. WATSON: Q. Perhaps, Mr. Daly,
12 you can help us with the Chairman's question.

13 I don't believe there is a critical time
14 path with respect to the NPLA. Is there one?

15 MR. DALY: A. There is no defined date
16 on making a life extension decision. All I can say is
17 that this work has been growing in importance as far as
18 the last few years and is entering our business
19 planning process more.

20 At some point in time - and I really
21 can't pin it down more specifically, you know - when we
22 are ready we will make the decision, and obviously we
23 are conscious of the fact that you can't wait too late.
24 You have to make the decision at a timely point.

25 THE CHAIRMAN: Well, I guess Mr. Watson's

1 question is: When is that?

2 MR. PENN: Maybe I can try help, Mr.
3 Chairman.

4 We haven't set a date when we are going
5 to make this decision, but it would be my personal view
6 that we would probably make it somewhere in the range
7 of year 27 to 33, and the reason I make that point is
8 that -- and there is another important point in
9 comparing the United States with Canada. Our
10 regulatory requirement is such that our licenses are
11 renewed every three, every two or every one year.
12 Clearly, our plants have to be up to acceptable
13 standards in order to gain renewal of license so that
14 there is a continual renewal. In the United States
15 they don't have that onus to meet.

16 The other point I would make is that --
17 so we are upgrading our plants all the time. At the
18 Ontario Energy Board every year we give evidence on the
19 depreciation and service life of all the major
20 components in the plant to ensure that we are properly
21 depreciating the plants.

22 But there will be some major decisions in
23 the future, such as the replacement of the whole
24 control room and the whole control system which clearly
25 is likely to be obsolete in somewhere approaching year

1 30, and so that would be a major decision which would
2 affect life extension decisions.

3 The other key point, which is the basis
4 for the 40-year life at the present moment is the
5 question of the metalurgical condition of the calandria
6 vessel, and we just aren't at a point in time where we
7 can make that decision yet. It is my judgment that we
8 would be at that point in time in the period of time
9 that I have mentioned.

10 MR. R. WATSON: Q. Thank you, Mr. Penn.
11 That was helpful. One question before I move on.

12 Mr. Penn, the Chairman and I were asking
13 about a critical path for the NPLA similar to the one
14 mentioned in the table on page 15 of Exhibit 572. In
15 answer to that question you indicated that no date had
16 been finalized for making a life extension decision.

17 In this table it gives, in effect, a
18 series of time frames for various things to happen. It
19 provides a path, if you will, where decisions are made
20 along the path, and I think that the concern of both
21 the Chairman and myself is: Is there some sort of
22 path, albeit very flexible, with respect to the NPLA?

23 MR. DALY: A. Perhaps a two-part answer,
24 Mr. Watson.

25 Some of the NPLA schedule was shown in

1 the report that was attached to the interrogatory.

2 Also, many of our activities at this
3 point in time are associated with the Pickering and
4 Bruce rehabilitation programs. Pickering
5 rehabilitation program is almost complete; the Bruce
6 rehabilitation program is getting under way in '94. So
7 there are extensive schedules and plans associated with
8 both these rehabilitation programs, both of which
9 support the objectives of the NPLA program.

10 Q. Mr. Penn, you have mentioned that you
11 have had discussions with other utilities, EPRI, and
12 apparently Hydro has had some conversations with
13 Monticello.

14 Have you had any discussions with
15 Virginia Power?

16 MR. PENN: A. I haven't personally had
17 discussions on this subject with Virginia Power, no.

18 Q. Are you aware that they have
19 performed an analysis of nuclear life extension for
20 their Surrey 1 plant?

21 A. Only through a passing review of the
22 literature. I am not familiar with it.

23 Q. So you are aware that that study
24 exists. Is anyone at Hydro following up on that? Are
25 there any communications between Hydro and Virginia

1 Power with respect to their life extension programs?

2 MR. DALY: A. I can't speak to that
3 specific one, but certainly as indicated in the
4 report - and you referred to it earlier - we have an
5 ongoing mandate between ourselves and Research and
6 Design to stay, you know, in tune with international
7 developments. So I expect that Mr. Andreeff and Mr.
8 Chadha are aware of the work in the States.

9 Q. Panel, you indicated that looking at
10 nuclear OM&A there was a substantial backlog in
11 maintenance in the past years, and this backlog
12 developed as a result of budget constraints during the
13 early and mid-1980s, and it was part of the impetus
14 behind the nuclear hiring program.

15 Did these backlogs in any way hamper your
16 ability to investigate issues such as plant life
17 extension?

18 A. Yes, to some extent. During that
19 period of time in the mid-to-late-'80s before
20 additional staff had come on board projects like this
21 did suffer to some extent.

22 Also, we were going through a
23 reorganization program, the CRESAP-related
24 reorganization, which led to some changes in
25 responsibilities, so the program -- this program did

1 suffer slightly. I wouldn't overemphasize it, but it
2 did suffer slightly.

3 Q. Mr. Penn, just one question, you
4 mentioned the OEB and the annual reviews. No doubt you
5 are aware that in 1990 Hydro underwent a net income
6 review, and one of the issues before the Board at that
7 time was the province's guarantee of Hydro's debt, and
8 the relation of that to Ontario Hydro's credit rating.

9 Are you aware of any evidence that would
10 suggest that Hydro's nuclear operations have impacted
11 on the province's credit rating in any way whatsoever?

12 MR. B. CAMPBELL: Mr. Chairman, having
13 been a participant or represented one of the
14 participants in that hearing, i.e. Ontario Hydro, I can
15 tell you that the matter of judgment as to what effects
16 and to what degree a provincial credit rating or the
17 rating of Hydro bonds which borrow on the credit of the
18 province is not something that these witnesses can
19 speak to.

20 I think it's quite an unfair question for
21 this Panel.

22 MR. R. WATSON: Mr. Chairman, I was
23 asking a very specific question about nuclear
24 operations. This is Hydro's Nuclear Panel; these are
25 the experts who can tell us about nuclear operations.

1 THE CHAIRMAN: They can't tell you about
2 the financial aspects, I don't think. Maybe somebody
3 should, but...

4 MR. R. WATSON: And my question was
5 simply, if they were aware of anything dealing with
6 nuclear operations which could impact on this issue.

7 MR. B. CAMPBELL: Well, I have no
8 objection to my friend asking questions about nuclear
9 operation, but in my submission this question is
10 exactly not about nuclear operation; it is about the
11 effect of those operations on the credit rating. And
12 that is a matter of, I can tell you, at OEB hearings of
13 considerable debate and argument and involves judgments
14 that have nothing to do with the nuclear operations per
15 se.

16 THE CHAIRMAN: That may be, but don't say
17 it is not a relevant question. It is just a question
18 that these particular people can't answer.

19 MR. B. CAMPBELL: These people certainly
20 cannot answer, and I would need to know a little more
21 about where my friend is going to determine whether it
22 is relevant at all.

23 But certainly I think my point simply at
24 this stage is that it is an unfair question to put to
25 this set of witnesses. There is no way they can answer

1 it.

2 MR. R. WATSON: Mr. Chairman, we have one
3 panel left. If Mr. Campbell is telling me I can ask
4 that question and pursue this area in Panel 10, then I
5 would be pleased to defer it to Panel 10.

6 MR. B. CAMPBELL: That is not what I am
7 saying, Mr. Chairman.

8 If my friend wants to speak to me and
9 tell me where he is going with this and do we have
10 appropriate expertise, I can deal with that.

11 [11:14 a.m.]

12 All I'm saying is that these witnesses
13 can't deal with that.

14 THE CHAIRMAN: I am going to suggest that
15 you put your question and it be the next undertaking
16 and Hydro can answer it, if they have any such
17 knowledge.

18 MR. R. WATSON: That's fine, Mr.
19 Chairman. The question is on the record.

20 THE CHAIRMAN: But I don't expect that
21 anyone on this panel has the kind of expertise about
22 what effects the guarantee.

23 MR. R. WATSON: The effects of the
24 nuclear operations on the--

25 THE CHAIRMAN: On the guarantee.

1 MR. R. WATSON: --on the province's
2 credit rating and on the guarantee, yes. So, yes, I'll
3 take that as an undertaking, Mr. Chairman. Thank you.

4 THE REGISTRAR: 532.3.

5 ---UNDERTAKING NO. 532.3: Ontario Hydro undertakes to
6 provide any information on the effects of
7 the nuclear operations on the province's
8 credit rating and on the guarantee.

8 MR. R. WATSON: Q. Mr. Penn, you have
9 mentioned the U.S. on a few occasions. I would like to
10 deal briefly with performance trends.

11 Would it be fair to say that nuclear
12 performance trends in the United States have improved
13 in the course of the 1980s?

14 MR. PENN: A. Yes.

15 Q. We know from your evidence that the
16 United States OM&A costs are considerably higher than
17 those for Ontario Hydro; is that fair?

18 A. Yes. In my evidence I said that our
19 OM&A costs were 50 per cent of the average OM&A costs
20 in the U.S. nuclear utilities.

21 Q. We know there is a relationship
22 between OM&A spending and performance, you have already
23 testified to that.

24 What I would like to explore, just for a
25 few minutes, is the regulatory environment, and looking

1 at the 1980s -- 1979 was a significant year for the
2 nuclear industry in the United States, that's when
3 Three Mile Island occurred. Would you agree with that?

4 A. Yes.

5 Q. And my understanding is that resulted
6 in increased regulatory activity; is that fair?

7 A. You mean in the United states?

8 Q. In the United States, yes.

9 A. Mr. King may be able to comment
10 better than I on this. I'm not aware that the
11 regulatory activity in the U.S. has ever abated, it has
12 gone on continuous since day one.

13 Q. I'm not suggesting that it was not
14 there and all of a sudden appeared, I was suggesting
15 that as a result of this, what was there was increased?

16 MR. KING: A. To my knowledge following
17 TMI there were a number of regulatory initiatives in
18 the United States which were applicable to the American
19 utilities and, in general, could be related to the TMI
20 incident.

21 Q. Is it fair to say that a combination
22 of the increased regulatory requirements and the large
23 OM&A budgets in the States has led to these improved
24 performance trends that we are seeing?

25 MR. DALY: A. I think there are some

1 other factors. One other factor was the creation of
2 the Institute of Nuclear Power Operation, sometimes
3 INPOL, which was formed around 1980 I believe which led
4 to the development of improved operating standards in
5 the States. So it was, in effect, a significant
6 approach to working smarter or to working better.

7 So I think that the work of INPOL was a
8 contributor as well as the other two factors you have
9 mentioned.

10 MR. R. WATSON: This is my last topic,
11 Mr. Chairman.

12 Q. Mr. Daly, you mentioned in your
13 evidence that Hydro does certain backfits. Do you
14 recall that?

15 THE CHAIRMAN: I'm sorry?

16 MR. R. WATSON: Backfits.

17 THE CHAIRMAN: Thank you.

18 MR. DALY: In my direct evidence?

19 MR. R. WATSON: Q. When Mr. Heintzman
20 was cross-examining you, he was discussing the nuclear
21 plant life assurance program and if you don't recall
22 it, I can turn up the page for you.

23 I don't believe it's a contentious issue.
24 It's Volume 24, page 21752.

25 THE CHAIRMAN: You mean, 124 I take it?

1 MR. R. WATSON: It's Volume 124, Mr.
2 Chairman.

3 THE CHAIRMAN: Yes.

4 MR. DALY: 21752?

5 MR. R. WATSON: Q. Yes, line 7.

6 MR. DALY: A. Yes, I have that, yes.

7 Q. You mentioned that in the context of
8 discussing the nuclear plant life assurance program
9 with Mr. Heintzman.

10 A. Correct.

11 Q. Just so that I know what we are
12 talking about, Mr. Daly, when we are talking about
13 backfitting, just to get a general idea, a utility or
14 someone does some research and development, or they get
15 an idea from somewhere and these new ideas, these
16 improvements, if they are economically and technically
17 feasible, can be implemented on existing units, and
18 that is backfitting; is that fair?

19 A. That's one example of backfitting.
20 The other would be backfitting to, say, upgrade a
21 safety system where perhaps the Board has expressed
22 their concerns, and one particular one that comes to
23 mind was the backfitting of the emergency cooling
24 system in Bruce "A", where that was backfitted
25 basically to make it consistent with the type of system

1 we saw in the later plants.

2 So there's a number of backfits which are
3 regulatory driven in addition to others which are more
4 of just an improvement nature.

5 Q. Sure. And backfitting can be related
6 to life extension, in fact, it can be an important
7 component of a life extension program; can't it?

8 A. It could be, yes.

9 Q. And backfitting is an accepted
10 international practice; is it not?

11 A. It's an accepted practice. The
12 amount and type differ from plant to plant and
13 obviously have to consider the economics of whether
14 it's worth doing.

15 Q. Certainly. I'm not trying to suggest
16 to you that every time someone thinks of an idea it's
17 good to do it, I'm just saying as far as backfitting is
18 considered, it's something that utilities consider in
19 the ordinary course of business and it's recognized
20 around the world.

21 A. That's correct.

22 Q. For example, I understand that
23 Germany is very interested in backfitting, it's used
24 extensively there.

25 My understanding is that recently they

1 have looked at safety-related backfits dealing with the
2 installation of additional independent heat removal
3 systems and additional emergency control rooms. Are
4 you familiar with that?

5 A. I'm not familiar with that. I don't
6 know if any of my colleagues are.

7 Q. Mr. Penn or Mr. King?

8 MR. KING: A. I think I'm vaguely
9 familiar with it but, as you say, backfitting is just a
10 simply changing something that you have there already
11 and it isn't something which is internationally
12 accepted, whether it's nuclear plants, chemical plants,
13 you just change something that is already there.

14 Q. No, I'm not trying to suggest, Mr.
15 King, that if Germany, for instance, backfits
16 additional emergency control rooms and, therefore, it's
17 accepted that everyone do this.

18 It's the concept of backfitting that is
19 accepted, everyone agrees that you look at it and if
20 it's technically and economically feasible, you do it.
21 And I was just giving some examples of what Germany
22 does. Is that fair?

23 A. Yes. I think you were suggesting, at
24 least to me, and maybe I interpreted incorrectly, that
25 there was something special. Like renovating your

1 house is backfitting your house.

2 Q. Certainly. Q. I think you are ahead
3 of me, Mr. King.

4 A. But those two instances you referred
5 to in Germany, over the years - and I forget exactly
6 what time period this was done - but I'm aware that the
7 emergency control rooms and the backup heat sinks,
8 there was some work done in Germany, and other places
9 and backfits of that nature.

10 Q. Sure. Just so we are not at odds
11 here, I am not trying to suggest that because Germany
12 did exactly these two things, Hydro should do them, but
13 does Hydro have a similar philosophy with respect to
14 backfitting, that if in fact it is technically and
15 economically feasible; in other words, if it is a good
16 idea, it makes sense, then you will look at backfitting
17 something on your nuclear stations?

18 MR. PENN: A. Yes, and I think we have
19 demonstrated that. And in my direct evidence I gave --
20 we normally call this capital modifications rather than
21 backfitting, and I gave a list of examples of what has
22 been done in our stations.

23 And, as Mr. Daly mentioned, one of the
24 major backfits was to increase the pressure in the
25 emergency coolant injection system at Bruce "A".

1 Q. Yes. These were safety related
2 backfits?

3 A. That one was, yes. But there were
4 other backfits associated with the upgrading of heavy
5 water that was recovered in the station, for example,
6 at Pickering "A". There was another non-safety related
7 matter.

8 Q. Mr. Daly, if you could look at page
9 16 of Exhibit 572, that is the first page of
10 Interrogatory 9.9.40.

11 THE REGISTRAR: Give that the number .46.

12 THE CHAIRMAN: 46.

13 THE REGISTRAR: 46, yes.

14 ---EXHIBIT NO. 520.46: Interrogatory No. 9.9.40.

15 THE CHAIRMAN: Thank you.

16 MR. R. WATSON: And, Mr. Chairman, I'll
17 just be referring to the response. You will note that
18 there are two attachments associated with the
19 interrogatory which I have not produced.

20 And, again, if the panel feels that they
21 are valuable in assisting them in the questions, I
22 certainly have no objection to them being produced.

23 Q. If you look at the fifth paragraph
24 starting with the words: "With regard to...", Mr.
25 Daly, the sentence reads:

1 With regard to the design of the
2 powerhouse to improve the protection of
3 safety related equipment and the design
4 for optimum human performance.

5 If I could just stop there. Looking at
6 those two programs, the protection of safety related
7 equipment and (2), the design for optimum human
8 performance, it seems to me that those could be
9 candidates for backfitting.

10 I'm not saying that you have the studies
11 right now to say that they are technically and
12 economically feasible, but it seems to me that they
13 could be candidates for backfitting; is that fair?

14 MR. DALY: A. That's correct, and there
15 has been some backfitting done on protection of safety
16 related equipment in the powerhouse.

17 Q. Okay. Now, the sentence continues:

18 Further clarification of these
19 issues had been sought through technical
20 discussions with the AECB but they were
21 terminated as a result of the moratorium
22 on CANDU "A".

23 I have a couple of questions on the rest
24 of the sentence, Mr. Daly, but first of all, could you
25 direct me to where I could get some more information on

1 these two programs; are they included in an
2 interrogatory somewhere, is there some documentation
3 which describes them?

4 MR. PENN: A. Well, maybe I can help
5 you. Certainly, as program manager responsible for
6 CANDU "A" before it was terminated, I had meetings with
7 the AECSB on the subject of the design of the powerhouse
8 and to try and gain an understanding of their views on
9 optimum human performance.

10 Now, I don't recall anywhere in the
11 interrogatory process documents on these two subjects
12 being provided and, in fact, our discussions with the
13 AECSB, as far as I was concerned, were preliminary, we
14 were in the early stages of the definition phase of
15 CANDU "A" when it was halted.

16 So as far as I know, there has been no
17 reports produced on that subject with regards to new
18 nuclear stations.

19 Q. Okay. Just so that I am not at a
20 loss here, Mr. Penn, I understand that you had
21 discussions with AECSB. The particular focus of this
22 question is whether Hydro has any studies, reports,
23 documentation with respect to the two items that are
24 mentioned here, the protection of safety related
25 equipment, No. 1; and the design for optimum human

1 health performance, No. 2.

2 Is there anything that you can provide to
3 me which would give me more information on those two
4 programs, and if there is no document, could I have an
5 undertaking for you to provide me with a brief
6 explanation of what these are about?

7 MR. KING: A. Could I get some
8 clarification here. The interrogatory is referring to
9 any programs with respect to a new CANDU station, so
10 you would like information regarding any activities on
11 these two issues here with respect to any new CANDU
12 station?

13 Q. Well, that's the primary focus of
14 this question, Mr. King, and of course I am concerned,
15 as I am sure you are aware, about whether these
16 programs could have been backfit to some of the other
17 stations.

18 If there are other documents which refer
19 to these programs with respect to the existing
20 stations, I would be interested in those as well.

21 A. Because in the response to the
22 Interrogatory No. 9.9.40, we gave two letters, one from
23 the president of the Control Board to our president,
24 Mr. Franklin, and then there was a letter in response
25 from Mr. Nittenberg to the president of the Control

1 Board; correct?

2 Q. Yes.

3 A. And really it's Mr. Levesque, the
4 president of the Control Board, he introduces the
5 subject with respect to new plants of this:

6 Design of the powerhouse to improve
7 the protection for safety critical
8 equipment and the design of optimum human
9 performance.

10 Q. Yes.

11 A. So this is where...

12 Q. I understand that, Mr. King. I know
13 the issue was raised, I know the issue apparently was
14 discussed, I just want some understanding of what the
15 issue is. I would like some documents, whatever you
16 have, that describe these two issues.

17 A. Okay.

18 MR. B. CAMPBELL: Well, you have asked
19 for an undertaking that either we produce documentation
20 or provide a brief description, and we will take that
21 undertaking.

22 MR. R. WATSON: That's fine, Mr.
23 Chairman.

24 THE CHAIRMAN: Make that an undertaking.

25 THE REGISTRAR: 532.4 Mr. Chairman.

1 THE CHAIRMAN: Thank you.

2 ---UNDERTAKING NO. 532.4: Ontario Hydro undertakes to
3 provide either brief explanation
4 or documentation re: programs
described in Interrogatory 9.9.40

5 MR. R. WATSON: Mr. Chairman, I note the
6 time but I am almost finished.

7 THE CHAIRMAN: That's all right.

8 MR. R. WATSON: Q. We note from this
9 interrogatory, panel, that these two programs were
10 terminated as a result of the Moratorium on CANDU "A".
11 You have indicated they were potential candidates for
12 backfitting.

13 Can you tell us if there are any other
14 programs, studies, anything that might have an impact
15 on backfitting or life extension or any related topics
16 that were affected by the moratorium, any additional
17 ones besides the ones that are mentioned here; and, if
18 not, could you provide an undertaking?

19 MR. KING: A. These programs here were
20 terminated as a result of the moratorium on CANDU "A"
21 and I believe your question here suggests that they
22 were terminated on other stations as well, maybe I
23 missed that, but that's not the case, because...

24 Q. What I'm suggesting --

25 THE CHAIRMAN: Wait a minute. Let Mr.

1 King finish. Go ahead, please.

2 MR. R. WATSON: Q. Please go ahead.

3 MR. KING: A. Because they are, for the
4 first one, safety related equipment in the powerhouse,
5 well, all of our stations -- well, Pickering, Bruce and
6 Darlington are all -- sorry, Pickering or Bruce, it was
7 in the original design of Darlington, but the Pickering
8 and Bruce stations have had backfits in the powerhouse
9 area with respect to the concerns that were in the AECB
10 letter, and that is why I take it that the president of
11 the AECB brought it up with respect to future plants
12 because we have already gone through and committed, and
13 I think in the majority of cases, already installed
14 those backfits in Bruce and Pickering.

15 Q. My question to you was: We have been
16 talking about the safety related equipment, the design
17 for optimum human performance, and you have given us an
18 undertaking that you are going to provide information,
19 and you have given us other information in your
20 evidence.

21 My question is: Are there any other
22 programs, any other initiatives, anything which was
23 affected by the moratorium which might be a possible
24 candidate for backfitting and might be related to life
25 extension?

1 MR. PENN: A. I think the answer to that
2 is no. The only thing that was affected by the
3 moratorium was that we were requested by the government
4 not to proceed with further studies on CANDU "A" or any
5 other new nuclear station until such time as the
6 moratorium were lifted, and it didn't have any effect
7 on backfits or capital modifications of any of our
8 other stations at all.

9 Q. But, Mr. Penn, we have seen here that
10 the moratorium on CANDU "A" had an impact on certain
11 programs which were being considered for CANDU "A",
12 these programs had the potential to be backfit.

13 My question to you is: Did the
14 moratorium on CANDU "A" affect any other programs
15 besides the ones that we have dealt with?

16 THE CHAIRMAN: I think he answered the
17 question and said no.

18 MR. B. CAMPBELL: He answered this.

19 THE CHAIRMAN: He answered the question
20 and said no.

21 MR. R. WATSON: With respect, Mr.
22 Chairman, I think he answered the question by saying
23 the moratorium affected CANDU "A" and--

24 MR. B. CAMPBELL: And did not affect...

25 MR. R. WATSON: --did not affect the

1 operating stations.

2 THE CHAIRMAN: That's right.

3 MR. R. WATSON: My question is, these
4 specific projects that I was referring to are
5 encompassed in CANDU "A".

6 THE CHAIRMAN: But Mr. King answered
7 about those specific projects.

8 MR. KING: These two examples have no
9 potential for backfit to the existing stations because
10 they have already been backfit to the existing
11 stations.

12 MR. R. WATSON: Right. And, Mr.
13 Chairman, if this is the evidence, then this is the end
14 of my cross-examination.

15 Q. As I understand it - and, Mr. Penn,
16 please correct me if I'm wrong - aside from these two
17 programs there were no other programs associated with
18 CANDU "A" which were affected by the moratorium, and
19 when I'm talking about programs, I'm talking about
20 those that had the potential for backfitting.

21 MR. PENN: A. The answer is no. There's
22 no other.

23 MR. R. WATSON: Thank you. Those are my
24 questions, Mr. Chairman.

25 THE CHAIRMAN: Thank you, Mr. Watson.

1 [11:35 a.m.]

2 THE CHAIRMAN: We will take a break now,
3 and then you are ready to start again, Mr. Bullock,
4 after the break?

5 MR. BULLOCK: I am, sir.

6 THE CHAIRMAN: Thank you.

7 THE REGISTRAR: Please come to order.
8 This hearing will take a 15-minute recess.

9 ---Recess at 11:37 a.m.

10 ---On resuming at 11:58 a.m.

11 THE REGISTRAR: Please come to order.
12 This hearing is again in session. Please be seated.

13 THE CHAIRMAN: Mr. Bullock?

14 MR. BULLOCK: Mr. Chairman, just with
15 respect to scheduling, I spoke to my friend, Mr.
16 Rodger, over the weekend, and he advises me that he
17 will not have any questions for this panel, and I hope,
18 sir, to be done either by the end of today or perhaps
19 into the first hour or so tomorrow just for my friends
20 who are considering their cross-examinations.

21 THE CHAIRMAN: Mr. Poch, are you next?

22 MR. D. POCH: I am next, sir, and ready
23 to go with a half hour's notice.

24 THE CHAIRMAN: Thank you.

25 MR. BULLOCK: Mr. Rodger extends his

1 apologies, sir. He would have been here in person, but
2 he had another hearing that he had to make --

3 THE CHAIRMAN: He has already informed
4 the coordinators that this was so, so it doesn't come
5 as a surprise.

6 MR. BULLOCK: Very good. Very good.

7 CROSS-EXAMINATION BY MR. BULLOCK (Cont'd):

8 Q. Mr. Daly, on Thursday afternoon you
9 will recall that I was asking you some questions about
10 the relationship between OM&A budget restraints in the
11 early 1980s and increased power purchases, imports, in
12 the late 1980s and 1990, and there was some confusion
13 at the end of Thursday about some answers respecting
14 that relationship.

15 So, sir, if I could I would like, please,
16 to take to you Volume 127 in Thursday's transcript,
17 page 22335 starting at line 5, and my question to you
18 on Thursday was:

19 Would it be fair to say that
20 particularly with reference to 1990, but
21 perhaps during the late 1980s as well,
22 did the budget restraints shown on page
23 70 of Exhibit 519 for OM&A, did those
24 contribute to those large imports?

25 And your answer was:

1 I would say they contributed
2 partially.

3 And you then went on to explain your discussions with
4 Mr. Heintzman, and you concluded your answer by saying:

5 So it would not be fair to attribute
6 all of these imports to reduced OM&A. It
7 would certainly be one factor, however.

8 And I asked you:

9 A fairly significant factor, would you
10 say?

11 And you said:

12 I would say significant but more the
13 sort of 20, 30 per cent level, not sort
14 of more than 50 per cent.

15 Having reviewed those answers today, sir,
16 speaking generally do you stand by those answers that
17 you gave at that time?

18 MR. B. CAMPBELL: Just a minute, Mr.
19 Chairman.

20 If my friend is going to draw attention
21 to the transcript I think in fairness he needs to
22 continue on at 22339 and following where this topic was
23 gone into--

24 MR. BULLOCK: By all means, Mr. Campbell.

25 MR. B. CAMPBELL: --in some greater

1 detail, and he talked about --

2 MR. BULLOCK: By all means, Mr. Campbell.

3 MR. B. CAMPBELL: -- bottom of 22339.

4 MR. BULLOCK: I had spoken to the witness
5 in advance, Mr. Chairman, about the issue, and I had
6 hoped that we might be able to shorten the question,
7 but I am happy to take you to the other pages.

8 They are pages, sir, starting at page
9 22339 and over to 22340 of Volume 127. Those are the
10 questions that my friend is referring to, starting at
11 line 25 on page 22339.

12 THE CHAIRMAN: All right.

13 MR. BULLOCK: Q. Do you have those?

14 MR. DALY: A. Yes, I have all of those,
15 yes.

16 Q. Very good, sir. Could I take you
17 back to page 22335?

18 A. Right.

19 Q. And I was asking you if you stood by
20 those answers on page 22335.

21 A. Yes, I stand by those answer. I
22 would particularly point to line 15 there, and perhaps
23 I could read the whole sentence?

24 Q. By all means.

25 A. As I mentioned earlier, I think in

1 discussing it with Mr. Heintzman we feel
2 that OM&A restraints have had a negative
3 impact on nuclear performance since about
4 1982/83 until the late 80s certainly.

5 And then the subsequent paragraphs that
6 Mr. Campbell has referred to, I think my basic point
7 there was that 1990 was a rather unusual year, unusual
8 in the amount of power purchases, and it was also a
9 year where we were already a couple of years into the
10 nuclear hiring program. So I didn't feel the
11 application of the factors we had discussed was
12 particularly appropriate for 1990. It was more
13 appropriate for the earlier years.

14 Q. But would you certainly agree that
15 there is a connection between the increased purchases,
16 the increased imports, and the budget restraints, the
17 OM&A budget restraints in the early 1980s; you would
18 agree there is that relationship?

19 A. In the early 80s the OM&A was one of
20 a number of factors which led to our performance being
21 poorer than we had hoped, and that in turn led to more
22 imports than we would have desired, yes.

23 Q. And so the imports cost, the cost of
24 the purchases is really attributable, if you will, in
25 some sense to the OM&A budget restraints? That is my

1 understanding; is that correct?

2 A. It is partially attributable. It is
3 rather difficult to put a precise figure on it because
4 there are many factors at work at the same time. We
5 mentioned the retubing factor, having to remove
6 Pickering 1 and 2 from service, and that was certainly
7 the major factor. We were commissioning a number of
8 other units at the time.

9 So there were a number of other factors,
10 but certainly in our opinion the OM&A restraints were
11 one of those factors.

12 Q. All right. And that is perhaps a
13 cost of those budget restraints that might not be
14 readily apparent unless the question was gotten into;
15 is that fair?

16 A. Yes. You have to look at what caused
17 the incapability in a particular year. Some of the
18 incapability we have experienced was clearly not
19 related to OM&A restraints. Other incapability we have
20 experienced was certainly more clearly related to the
21 restraints.

22 Q. Thank you, very much.

23 Mr. Penn, if I could take you, please, to
24 the correction that you made on the record this morning
25 I must say I had some trouble with the clarification.

1 I thought I understood your initial answer, and I am a
2 little bit confused now.

3 So perhaps I could take you again to
4 Volume 127, page 22360, commencing at line 19. This is
5 the discussion about the \$3.3 billion figure?

6 MR. PENN: A. Yes?

7 Q. It is relating to the Darlington cost
8 overruns, if we can use that term.

9 Perhaps I could just ask you this, Mr.
10 Penn. If there had been no delays in bringing
11 Darlington on line, if there had been no delays at all,
12 what would have been the cost saving, the total cost
13 saving?

14 A. Well, it is a matter that I am not
15 readily able to answer today, and to allow your
16 understanding of the difficulty that the planned
17 scheduled delays as shown in the Exhibit 539--

18 Q. Yes?

19 A. --in Appendix 2 spanned a period of
20 time from 1979 through to 1986, as we discussed last
21 Thursday.

22 And if they hadn't happened, then you
23 have to consider what the implications of them
24 happening were and then be able to value what these
25 implications are so that you can subtract them from the

1 cost.

2 And just to give you a feel of the nature
3 of those implications these planned schedule changes
4 caused: one, disruption in the planned mobilization of
5 the construction and design work force; two, they
6 caused loss of productivity in the human resources that
7 were in place at the start of each of those changes.

8 Q. Because it is always less costly to
9 proceed without interruption; isn't that right?

10 A. Quite so. A third point is that it
11 reduced continuity between the Bruce "B" project and
12 Darlington, the continuity in flow of information and
13 utilization of forces as they became available.

14 Fourth, it caused disruption and
15 interruption of the major equipment orders which were
16 placed in 1979 for such things as the calandria, the
17 steam generator, the steam turbines, the generator, the
18 steam generators--

19 Q. Now, Mr. Penn, I wouldn't want to
20 interrupt you if you--

21 A. --and the like.

22 Q. --wish to consider, but what I was
23 really getting at was the dollar figure, and I think
24 you have said that it is a difficult one to calculate a
25 precise figure for; is that right?

1 A. Yes, and I don't have it with me
2 today.

3 Q. Could we agree that it would have
4 been several billion dollars?

5 A. Well, we can certainly agree that it
6 is a substantial amount of money. Whether it is
7 several billion dollars I am not in a position to
8 confirm. I would be surprised if it is several, like
9 three or more.

10 Q. Would it have been between one and
11 three billion dollars?

12 A. I really can't tell you. This is a
13 matter that may be possible to evaluate but I just got
14 through four points and there are at least another four
15 problems in doing this, and it is very difficult for me
16 on this witness stand to hazard a guess at something
17 that I don't have in front of me.

18 Q. Would you like the opportunity to do
19 that calculation and reflect upon it?

20 THE CHAIRMAN: I take it you are not
21 asking for a fine-tuned calculation; you are asking for
22 a ballpark figure. Is that right?

23 MR. BULLOCK: Precisely, Mr. Chairman. I
24 thought I had the answer, 3.3 billion, and I am now
25 told that I don't, and I would like to know what the

1 number is.

2 MR. B. CAMPBELL: Your question wasn't
3 about the 3.3 billion. I think that is part of the
4 problem here. 3.3 was purely related to the interest
5 expense.

6 We know what the increased interest
7 expense was, and, as Mr. Penn pointed out this morning,
8 the increased interest expense related to all of the
9 reasons for scheduled delay, not just the planned ones.
10 That was as he pointed out this morning.

11 But this question goes far beyond the
12 question of interest expense.

13 MR. BULLOCK: I think if we look at the
14 transcript --

15 THE CHAIRMAN: Just a moment. Let me
16 just get up to speed.

17 There are two kinds of delays. One is
18 called planned scheduled delay and the other is called
19 scheduled slippage.

20 MR. BULLOCK: Quite so.

21 THE CHAIRMAN: Now, do you mean both of
22 those or just one of those?

23 MR. BULLOCK: I would like both, sir.

24 THE CHAIRMAN: So your question about the
25 cost implications of the delays cover both those kinds

1 of delays?

2 MR. BULLOCK: Well, sir, there must be a
3 total cost involved with all of the delays.

4 THE CHAIRMAN: Right. Okay.

5 MR. BULLOCK: Then there must be, I would
6 submit to you, a cost involved with the planned delays.
7 And I can appreciate that there may be some judgment
8 applied in apportioning those.

9 THE CHAIRMAN: But your initial question
10 is the comprehensive figure; is that correct?

11 MR. BULLOCK: Yes, sir. And then, my
12 next question is: Is Mr. Penn able to or would he be
13 kind enough to apportion it between the planned and
14 what I would call the unplanned delays, and I think
15 that flows very --

16 THE CHAIRMAN: Let's take it one thing at
17 a time.

18 MR. BULLOCK: Yes, sir.

19 THE CHAIRMAN: We are still on the first
20 one.

21 I take it that you would agree that there
22 was some cost involved?

23 MR. PENN: Oh, very definitely, sir, Mr.
24 Chairman.

25 There is no problem, and we have already

1 stated what the total interest due to delays -- there
2 was interest due to other reasons as well, but due to
3 total scheduled delays, planned and slippage, is
4 because relative to the definitive estimate you know
5 what the total cash flow is through the total project
6 so that you can readily calculate that number.

7 What I thought Mr. Bullock was asking me
8 was: What would the cost of Darlington have been if
9 there hadn't been any planned delays? And that is a
10 much different type of question because you are trying
11 to evaluate what the cost would be, as I mentioned
12 before, in having to renegotiate contracts.

13 THE CHAIRMAN: I appreciate how extremely
14 difficult that would be to do in any precise way, and I
15 guess I just was interested to know whether there had
16 been done or whether you would have any views, I mean
17 in the range of billions of dollars, of what we are
18 talking about.

19 MR. PENN: I believe, and obviously I was
20 aware of this type of question coming up on Thursday,
21 and my advice I received about whether we can do that
22 is that yes, we may, but it could take us a week to do
23 it.

24 THE CHAIRMAN: Even to get a ballpark
25 figure?

1 MR. BULLOCK: Order of magnitude is what
2 I am looking for.

3 MR. PENN: Well, we assume that the
4 ballpark figure has to --

5 THE CHAIRMAN: This being opening day I
6 suppose it is appropriate to be talking about ballpark
7 figures. [Laughter]

8 MR. BULLOCK: And let us not miss Mr.
9 Asimov's passing as well, Mr. Chairman.

10 MR. PENN: I was in touch with Darlington
11 project this weekend, and they did say that they could
12 attempt to do that. I was advised that it may take up
13 to a week.

14 THE CHAIRMAN: All right. Well, there we
15 are, Mr. Bullock.

16 MR. BULLOCK: Q. Well, just so I am
17 clear then, Mr. Penn, I think your evidence is that if
18 there had been no delays the total cost savings would
19 have been at least the interest component, so it would
20 have been at least \$3.3 billion; is that correct?

21 MR. PENN: A. That's correct.

22 Q. And when we then start to talk
23 about --

24 A. That is for the total --

25 Q. I understand. And when we then start

1 to talk about apportioning what was attributable to
2 planned delays and what was attributable to slippage,
3 that calculation would take, even to get a ballpark
4 figure, about a week. Is that where we are at?

5 A. I think that is where we are at. I
6 mean, obviously we can try harder.

7 MR. BULLOCK: I guess I would like to
8 know, Mr. Chairman, again, we are talking orders of
9 magnitude here. I certainly don't expect Mr. Penn or
10 his team to try to come up with a figure to the closest
11 million dollars, but I think it is important for this
12 Board and for the public to know in orders of magnitude
13 what was attributable to the planned delays; in other
14 words, the decisions beyond the control of the CANDU
15 "A" team, -- or the Darlington team, I'm sorry.

16 MR. B. CAMPBELL: Mr. Chairman, I would
17 like, rather than undertake what -- given the nature of
18 the kinds of things that Mr. Penn was listing out,
19 there are clear -- I mean, the amount of judgment that
20 would have to go into making those apportionments to me
21 would make the figure highly suspect in any event.

22 What I would like to suggest to my friend
23 is that what is before the Board is a much more useful
24 figure, and that is Ontario Hydro's cost estimate for
25 the CANDU "A" project which takes into account both the

1 Darlington experience and says what we have learned
2 from that experience is this and we believe we can now
3 build a CANDU "A" station for this much money. And
4 there is an enormous amount of information on that.

5 MR. BULLOCK: It is already in evidence,
6 and that I didn't particularly want to rehash.

7 MR. B. CAMPBELL: Well, I am just
8 suggesting, Mr. Chairman, that that surely in terms of
9 any figure as to the overall effect of the lessons
10 learned from Darlington delays it seems to me that that
11 is the body of information that is reliable as opposed
12 to trying to make these apportionment judgments, and it
13 reflects the actual experience at Darlington and the
14 judgment as to the extent to which it would be
15 applicable to any future station, which in my
16 submission is the relevant question for this Board, not
17 the question that my friend has asked.

18 [12:16 p.m.]

19 THE CHAIRMAN: I thought I heard Mr. Penn
20 say that he could come up with a figure but it would
21 take about a week.

22 And that is the figure you would like to
23 have, I take it?

24 MR. BULLOCK: Yes.

25 THE CHAIRMAN: Perhaps you should

1 articulate it specifically so that there's no
2 misunderstanding about what it is that is being asked
3 for and what Mr. Penn understands he can provide.

4 MR. BULLOCK: Certainly.

5 Q. What I would like to know, Mr. Penn,
6 is if there had been no delays in bringing Darlington
7 on-line, we know there would have been a certain cost
8 saving and we know that that would have been more than
9 or at least \$3.3 billion; correct?

10 MR. PENN: A. Correct.

11 Q. And what I would then like you to do
12 is, I would like you to take that cost saving and
13 apportion it as to what is attributable to planned
14 delays and what is attributable to other delays; in
15 other words, so we know what the cost --

16 THE CHAIRMAN: Just before we get to the
17 apportion, what is it that he is taking to apportion?

18 MR. BULLOCK: He is taking the total cost
19 savings that there would have been had Darlington been
20 brought on line without delay - and we know, Mr.
21 Chairman, that that is \$3.3 billion or more - and he
22 is then apportioning that between planned delays and
23 other delays, be they scheduled slippage or whatever.

24 THE CHAIRMAN: Well --

25 MR. BULLOCK: So that we know, sir, the

1 cost --

2 THE CHAIRMAN: Well just a moment, hold
3 it. They have analyzed this as planned scheduled
4 changes and scheduled slippage, two categories only.
5 Are you suggesting there is a third category?

6 MR. BULLOCK: No, sir. I'm suggesting
7 that there may be a third category that you and I don't
8 know about and, if there is, I'm happy to have Mr. Penn
9 simply lump it all together in the other delay
10 category.

11 THE CHAIRMAN: Now, is that possible to
12 do or do you know?

13 MR. PENN: I'm afraid, Mr. Chairman, I'm
14 having difficulty understanding. There certainly
15 aren't any other delays.

16 MR. BULLOCK: That's fine.

17 MR. PENN: That I'm aware of, and I don't
18 quite know what I'm apportioning to what, I'm afraid.

19 MR. BULLOCK: What I would like to --

20 MR. PENN: When I have come up with these
21 numbers, if I can.

22 MR. BULLOCK: Q. Mr. Penn, we know that
23 if Darlington had been brought on line without delay,
24 we know that there would have been a cost saving of at
25 least \$3.3 billion; correct?

1 MR. PENN: A. In interest, correct.

2 Q. And there may have been other savings
3 as well.

4 A. I think that's totally speculative.
5 I don't know.

6 Q. In any event, what I am trying to
7 ascertain is what percentage of that \$3.3 billion
8 saving can be attributed to the delays caused by
9 planned delays?

10 A. Yes, I understand that.

11 Q. Right. That's the figure I'm getting
12 at. Is it half, is it three quarters, what is it?

13 I understood your evidence to be that it
14 would take a week to determine that figure, even in a
15 gross way.

16 A. Well, assuming we can do it, and I
17 hadn't finished my long list of reasons for the
18 difficulty and, if I may, I would just like to complete
19 them.

20 I talked about the disruption and
21 interruption of the major equipment orders in 1979.
22 Subsequent to that we renegotiated and took contract
23 penalties on certain items. The borrowing levels of
24 money and the interest payments over the years would
25 have a part to play in coming up with this.

1 In essence, because of the delay, we
2 pushed dollars of the year expenditures spent into the
3 future, into different escalation situations.

4 One final point which would be very
5 difficult to assign is that because the project took a
6 long time from conception in 1975 to now, there were
7 considerable regulatory changes over those many years
8 which caused rework and changes to the design, so that
9 if we hadn't had those planned changes in delays in the
10 early going, then we may have been operating under a
11 different regulatory circumstance, and that would be
12 very difficult for us to evaluate from a financial
13 point of view.

14 So having made all those
15 qualifications --

16 MR. BULLOCK: Mr. Chairman, the reason I
17 posed the question and the reason I think the
18 information is important to the Board is it's one thing
19 to say it will be less costly if we proceed without
20 interruption, it's another thing to have a sense of the
21 absolute dollars that one is talking about when one is
22 talking about proceeding with interruptions or without
23 interruptions.

24 That is why I posed the question, sir,
25 and I can appreciate certainly from Mr. Penn's

1 description that --

2 THE CHAIRMAN: It's an extremely
3 difficult calculation to make because of the number of
4 variables.

5 MR. BULLOCK: Then I am in your hands,
6 Mr. Chairman.

7 MR. B. CAMPBELL: Mr. Chairman, before
8 you make any determination --

9 THE CHAIRMAN: Just let me finish my
10 thought so I don't forget.

11 I would have thought that there would be
12 some kind of rough estimate that Ontario Hydro would
13 have as to what the Darlington program had cost or
14 might have cost without delays.

15 I don't know, perhaps there isn't, but I
16 would have thought they might have made that kind of a
17 calculation.

18 MR. B. CAMPBELL: Mr. Chairman, I think
19 that takes me back to the point that I was making
20 before. A CANDU "A" was intended to be a Darlington
21 type plant and all of the experience of Darlington
22 including regulatory change, all of those matters, for
23 a project of a Darlington type plant that was commenced
24 and carried through with cost and schedule improvements
25 that have been studied as a result of the Darlington

1 experience are reflected in the cost estimates that are
2 before you on CANDU "A".

3 And, in my submission, the best answer
4 that can be provided to my friend is to compare the
5 CANDU "A" estimates with the Darlington actuals, and it
6 will then be clear to him that without delays, in light
7 of the decisions that are in front of this Board, that
8 that is the relevant comparison.

9 I am extremely reluctant to commit the
10 Darlington project members to doing this kind of
11 analysis when they are in the middle of a program of
12 trying to bring that facility into service that is
13 occupying 100 per cent of their attention.

14 And, in my submission, given the
15 qualifications that Mr. Penn had mentioned, even if it
16 was done and a week of their time was spent on it,
17 which would necessarily involve the project manager
18 there, that it would give you a far less useful answer
19 than the one that is already before you by way of the
20 CANDU "A" estimates which have taken all this into
21 account.

22 THE CHAIRMAN: Are you saying it's just
23 as simple as taking the Darlington actual costs and
24 subtracting the CANDU "A" and the result is the answer
25 to the question that Mr. Bullock wants answered?

1 MR. B. CAMPBELL: In the same net present
2 value.

3 THE CHAIRMAN: Is that what you are
4 saying?

5 MR. B. CAMPBELL: That's exactly what I'm
6 saying. That that is Hydro's current view as to what
7 it would cost to build a station of the Darlington
8 type.

9 THE CHAIRMAN: All right, all right.

10 MR. B. CAMPBELL: That's what CANDU "A"
11 was.

12 THE CHAIRMAN: Now, Ms. Patterson points
13 out that that wouldn't break down the planned scheduled
14 changes or the scheduled slippage changes. We would
15 just have a ballpark figure for the whole thing.

16 MR. B. CAMPBELL: That is's correct, you
17 would have a figure that says: on this scheduled
18 assumption, which is start work and proceed through
19 without these kind of delays, here is the kind of cost
20 that would occur and, no, it doesn't give you detail as
21 between--

22 MR. BULLOCK: We know that number.

23 MR. B. CAMPBELL: --planned scheduled
24 change and scheduled slippage but, in my submission,
25 given the qualifications that Mr. Penn has put around,

1 and the number of judgments that he has had to list as
2 to what would have to be done doing that, it is a
3 number that is, in my submission, neither as relevant
4 nor in any way as useful to the Board as the CANDU "A"
5 estimates which are a different way of coming at the
6 same overall question.

7 And, as I say, I am reluctant to commit
8 the Darlington project to doing that calculation, given
9 the effort they are trying to put into bringing this
10 station on line.

11 MR. BULLOCK: My submission, Mr.
12 Chairman, would simply be the one that Ms. Patterson
13 raised which is that we know what the global figure is,
14 it's 3.3 billion or more, and my submission to you,
15 sir, would be that historic emperical data is always of
16 more assistance or typically of more assistance to this
17 Board than estimated information.

18 THE CHAIRMAN: But if they say they can't
19 do it, we just have to accept that; don't we, Mr.
20 Bullock?

21 MR. BULLOCK: But that's not what they
22 have said, sir. I'm in your hands.

23 THE CHAIRMAN: I think they have. I
24 think that's what they said, for the eight or nine
25 reasons that Mr. Penn has given he can't come up with

1 that figure.

2 MR. BULLOCK: I think he said it's a
3 complicated task and it will take a week.

4 THE CHAIRMAN: No, no, that's not what he
5 said would take a week. I think the thing that you are
6 asking for is to try and somehow or other assess what
7 the costs would have been if there hadn't been these
8 delays and apportion it between the two types of
9 delays.

10 That's the thing that he said eight or
11 nine things cause him problems, and he says he can't do
12 it. So if he can't do it, he can't do it and that's
13 the end of it.

14 MR. BULLOCK: I don't believe that that's
15 the case, sir.

16 Q. Mr. Penn, I believe you said that
17 that exercise would take about a week; did you not?

18 MR. PENN: A. I think I said - and I
19 would have to look at the transcript - that it would be
20 very difficult to do this because of those reasons that
21 I gave.

22 Q. And it would take about a week?

23 A. And when I had consulted on this
24 matter this weekend I was advised that if it could be
25 done it would take up to a week.

1 If I didn't say that, that's what I meant
2 to say.

3 MR. B. CAMPBELL: I'm sorry.

4 MR. BULLOCK: Then it is not an
5 impossible task, it would just take a while. There's
6 the rub. It's not an impossible task, it would just
7 take a while. I just don't want that point to be lost,
8 Mr. Chairman.

9 And other than that, sir, I am in your
10 hands.

11 MR. B. CAMPBELL: I am sorry, Mr.
12 Chairman. Just so that I'm making my submissions on a
13 factual basis, Mr. Penn, is the week to come up with an
14 estimate of that, bearing in mind the factors you
15 listed, is that in relation only to the 3.3 billion
16 interest figure, or is that overall project cost?

17 MR. PENN: Well, it was my understanding
18 what the question was --

19 MR. B. CAMPBELL: I'm sorry, Mr. Penn, I
20 have to make some submissions on some basis here and I
21 would just like to get on the record the factual basis
22 on which I -- when you are talking about spending a
23 week, are you talking about spending a week just to
24 figure out the allocation of the 3.3 between the
25 planned and the slippage, that is the interest figure,

1 or are you talking about going through all of the
2 project costs and allocating increased costs, planned
3 slippage, is it that job that takes a week, because
4 they are two different jobs as I understand them.

5 You know, the total increase in costs or
6 just the 3.3?

7 MR. PENN: Well, to be quite clear, as I
8 said earlier this morning, the 3.3 is the interest from
9 the definitive estimate that was produced in 1981. Two
10 of these delays occurred prior to that but were allowed
11 for in the definitive estimate. That's the first point
12 to make.

13 The second point is that clearly to be
14 able to proportion the interest only for the two sets
15 of planning periods would be easier than to assign the
16 impact of the planned delays on the total project costs
17 and I am doubtful, personally, that it can be done.

18 MR. BULLOCK: That the latter can be
19 done?

20 MR. PENN: That the latter can be done.

21 MR. BULLOCK: Q. Well, then let us do
22 the former because we know that the latter must surely
23 be a larger sum; isn't that right?

24 THE CHAIRMAN: So we are just doing the
25 interest; is that right?

1 MR. BULLOCK: If we are just doing the
2 interest, Mr. Chairman, it seems to me that when we
3 talk about the total cost it must surely be a larger
4 sum.

5 Q. Isn't that right, Mr. Penn?

6 MR. PENN: A. Well, it's indeterminate
7 at the moment, Mr. Bullock. I really can't give a
8 comment on that.

9 THE CHAIRMAN: There could be offsets.

10 MR. B. CAMPBELL: There are advances as
11 well, Mr. Chairman.

12 THE CHAIRMAN: There could be offsets.

13 MR. BULLOCK: And there is why the
14 question that I posed is the important one.

15 THE CHAIRMAN: You've got the whole
16 problem of rates, you have got timing. I think it's a
17 very, very complex question.

18 MR. BULLOCK: Well then, I'm in your
19 hands, Mr. Chairman. I think it's an important
20 question --

21 THE CHAIRMAN: Well, that is what I am
22 trying to wrestle with now that we have got this, why
23 is it important. Of course the cost of nuclear
24 generation is an important issue, but whether the
25 historical costs at Darlington - they will certainly

1 also be of great interest I am sure, but whether this
2 particular breakdown will help us, I'm just not sure
3 and I haven't thought it all through to be truthful
4 with you.

5 MR. BULLOCK: Perhaps the Board could
6 take it under advisement over the lunch break or
7 whatever, and I'm happy to move on, Mr. Chairman.

8 I was content with the answers we had on
9 the record at the end of Thursday and the only reason I
10 had gotten into this was because of the clarification
11 that was raised this morning that seemed to detract
12 from the answers on the record.

13 And I'm happy, sir, perhaps --

14 THE CHAIRMAN: Well, perhaps we can
15 unravel it. Perhaps the parties can unravel it. If
16 they can't--

17 MR. BULLOCK: I'll be happy to speak to
18 my friends at lunch.

19 THE CHAIRMAN: --we will have a look at
20 it over the lunch hour and see what we will do after
21 lunch.

22 But let's go on to something else.

23 MR. BULLOCK: Certainly, sir.

24 Perhaps we could move to the CNA
25 interrogatory brief, Mr. Chairman, and I provided Mr.

1 Lucas with copies for the Board and I believe the
2 gentlemen of the panel and my friend has copies of
3 that.

4 I would like to deal first with what I
5 would --

6 THE REGISTRAR: Which one are you
7 referring to, please?

8 MR. BULLOCK: The interrogatories brief,
9 Mr. Lucas, the bound volume.

10 THE REGISTRAR: The Board has it, thank
11 you.

12 MR. BULLOCK: Very good. And I would
13 like to deal, Mr. Chairman, first of all with --

14 THE CHAIRMAN: There's nothing in here
15 but interrogatories, as I understand it; is that right.

16 MR. BULLOCK: That's correct, Mr.
17 Chairman. I would like to deal with, sir, what I would
18 call the supplementary Panel 9 reports and those can be
19 found, sir, at tab 2 which is Interrogatory No. 9.44.2
20 which has already received a Panel 9, 520 number, it's
21 520.29.

22 If we flip, Mr. Chairman, to tab 3,
23 interrogatory 9.44.3, you'll see, sir, it just is a
24 question of timing. The first question asks about
25 studies undertaken and not yet completed, and

1 interrogatory 9.44.3 at tab 3 talks about studies that
2 are contemplated.

3 THE REGISTRAR: That is given the number
4 520.47.

5 ---EXHIBIT 520.47: Interrogatory No. 9.44.3.

6 MR. BULLOCK: Thank you, Mr. Lucas.
7 Caused. And perhaps through you, Mr. Penn -- I propose
8 to deal with both together, Mr. Chairman.

9 Q. Through you, Mr. Penn, I take it that
10 the information that has been provided in answer to
11 Interrogatory 9.44.2 is information that can be relied
12 upon by the Board; is that correct?

13 MR. PENN: A. That's correct.

14 Q. These are reports that have been
15 prepared by Ontario Hydro and they are current as of
16 today; is that correct?

17 A. That is correct.

18 Q. And what's referred to are three,
19 what I have called supplementary Panel 9 reports. The
20 first is Exhibit 507; correct? It's the answer, sir,
21 to Interrogatory 9.44.2.

22 A. I believe that is the number, yes.

23 Q. I believe the date on Exhibit 507 was
24 February 25th of 1992; is that correct?

25 A. Subject to check, I will accept that,

1 yes.

2 Q. I am looking at the cover and I
3 believe.

4 DR. WHILLANS: A. That's the date on my
5 copy.

6 Q. Can I ask you, Mr. Penn, when the
7 information in that report was provided to the team
8 preparing the update, if you know?

9 MR. PENN: A. Just so that I'm not
10 confused, Mr. Bullock, are we talking about the
11 preliminary nuclear options review?

12 Q. No, sir.

13 A. Or are we talking about the cost
14 update for the future 4 by 881?

15 Q. We are not talking about that either.

16 A. Ah.

17 Q. We are talking about Exhibit 507.

18 A. Well, that's helped me a great deal.

19 Q. Exhibit 507.

20 A. Thank you. I have that now, thank
21 you.

22 Q. Very good. The answer to
23 interrogatory 9.44.2 refers to three studies, the first
24 is Exhibit 507.

25 A. You are quite right.

1 Q. The second is --

2 A. I am up to speed now.

3 Q. Okay. And my question, sir, was the
4 date is February 25th, 1992.

5 A. Yes.

6 Q. On Exhibit 507; correct?

7 A. Yes.

8 Q. And my question to you was: Do you
9 know or does any member of the panel know when the
10 information in that report was provided to the team
11 preparing the update, Exhibit 452?

12 A. Well, the people associated with the
13 team, particularly Mr. Brian Dalziel and Mr. Ken
14 Snelson were involved in the preparation of this
15 document, or at least its discussion.

16 [12:37 a.m.]

17 Q. So they certainly had the information
18 in advance of preparation of Exhibit 452?

19 A. They had an understanding of the
20 nature of information that would be in 507.

21 Q. All right.

22 A. 507 was prepared through a series of
23 series of draft documents that culminated in the final
24 document which was published on February the 25th.

25 Q. So they probably had an earlier

1 draft; is that right?

2 A. They probably did.

3 Q. All right. Can we move on, then, to
4 the ONCI update, which is attached as an answer to
5 Interrogatory No. 9.44.2?

6 A. Yes.

7 Q. The date on that document is
8 February, 1992?

9 A. That's correct.

10 Q. So that is current as of today and
11 the Board can rely upon the information in that
12 document?

13 A. They can.

14 Q. When was that document provided to
15 the Update team?

16 A. Well, it was again similar. The
17 staff in system planning division actually produced the
18 levelized unit energy costs that are shown in the table
19 1 so that they were aware of this information certainly
20 in the period of December, January, February.

21 Q. Well, the Update was issued January
22 15th, 1992, so are you telling us that they would have
23 had the information before the drafting of that
24 document?

25 A. The people who calculated the

1 levelized unit energy cost were members of the System
2 Planning Division, who in turn were party to the
3 Update.

4 Q. Right. So who were the authors,
5 then, of the ONCI cost update?

6 A. The author of this is a gentleman
7 named Mr. Jay Huterer, who reports to me.

8 Q. Very good. And you would have
9 reviewed the final draft?

10 A. Yes, I did.

11 Q. And can we move on then to the
12 Nuclear Options-Preliminary Review document, which is
13 the third, what I have called supplementary Panel 9
14 report?

15 A. Yes.

16 Q. When was it prepared, Mr. Penn?

17 THE CHAIRMAN: Is it part of the material
18 that we have?

19 MR. BULLOCK: It is, sir. It is at tab
20 2. It is the last document in tab 2. It is rather a
21 lengthy document.

22 THE CHAIRMAN: Oh, I see.

23 MR. BULLOCK: Unfortunately, the pages
24 are not numbered, sir. This is what the first page
25 looks like. It is entitled at the top Nuclear

1 Options-Preliminary Review.

2 THE CHAIRMAN: And has it been filed
3 before?

4 MR. BULLOCK: It has, sir, under number
5 520.29.

6 THE CHAIRMAN: Okay.

7 MR. BULLOCK: It was referred to earlier
8 by Mr. Heintzman.

9 MR. PENN: And I referred to it in my
10 direct evidence.

11 MR. BULLOCK: I believe that's so.

12 MR. PENN: Yes.

13 MR. BULLOCK: Q. The date, sir, that it
14 was prepared?

15 MR. PENN: A. Well, this report was
16 based upon information that we collected during the
17 period of about September to the mid/end November, and
18 there were several versions, draft versions again of
19 this report, and it was finalized relatively recently.
20 I don't have the cover sheet in your bound volume, so
21 I --

22 Q. Nor did I receive one.

23 A. So I can't tell you the exact date at
24 which this was sent as an interrogatory response
25 actually.

1 Q. Well, that date we do know. If we
2 look at the sheet that accompanies Interrogatory
3 9.44.2, the date answered indicates, I believe, March
4 13th, 1992. That was the date that it was provided. I
5 am more interested in the date of issue or the date of
6 preparation.

7 I am happy to have Mr. Penn check over
8 lunch, Mr. Chairman.

9 A. Well, I think I have answered the
10 question, that the actual date on which this was issued
11 was in response to that interrogatory.

12 Q. So it was prepared --

13 A. But it was in various forms because
14 it was based on information that we gathered in 1991
15 prior to that and was well-known to the people involved
16 in the Update Plan of Ontario Hydro. In fact, one of
17 the members of the team, with myself and others, that
18 put this together comes from system planning division.

19 Q. So could you tell us who the authors
20 of the Nuclear Options Preliminary Review are?

21 A. Yes. They would be Mr. Jay McConnach
22 and myself. I think Mr. Daly had a part in it.
23 Certainly -- who else? And other staff in my group
24 from system planning.

25 Q. The information in that review was

1 provided, I believe you said, to the system planners
2 preparing the Update in advance of the preparation of
3 that document; correct?

4 A. They were fully aware of it, yes.

5 Q. So that would have been provided in
6 the autumn of last year, 1991?

7 A. Well, I don't remember, in the
8 autumn, certainly.

9 Part of the Update relates to the fact
10 that the CANDU 6 is taken for illustrative purposes to
11 be an option to consider in the Update, and the cost
12 information involved in the Update is based on this
13 study.

14 Q. And now a matter of integration, Mr.
15 Penn. Perhaps I could take you to Exhibit 3, chapter
16 14, please. You will still need the interrogatory as
17 well. All right?

18 Perhaps I could take you to figures 14.2,
19 page 14.8, if you could have a look at that figure.
20 And also, Mr. Penn, just over a couple of pages, figure
21 14.5 at page 14.12.

22 Are there any errata, Mr. Campbell, for
23 either of those figures?

24 MR. B. CAMPBELL: I would have to check,
25 Mr. Chairman. I don't keep it in my head.

1 MR. BULLOCK: Q. Do you have them, Mr.
2 Penn?

3 MR. PENN: A. Yes, I do. I am just
4 trying to remind myself of the contents of them. Thank
5 you.

6 Q. Do you have them? Now, could I take
7 you, please, to pages 6 and 9 of the Preliminary
8 Review, tables 3.1 and 3.2, and again, just a matter of
9 integration, Mr. Penn.

10 I would just like you to agree with me
11 that those tables from the review, Preliminary Review,
12 would be best integrated at figures 14.2 and 14.5 in
13 chapter 14 of Exhibit 3. Would you agree that that
14 would be an appropriate place to integrate those two
15 tables?

16 THE CHAIRMAN: I'm sorry, I don't follow
17 the question. What do you mean? You mean replace
18 table 3.1 with --

19 MR. BULLOCK: Have them be addenda, Mr.
20 Chairman.

21 Figure 14.2 talks about major supply
22 options potentially available, and figure 14.5 speaks
23 of components of fossil and nuclear options, and all I
24 am trying to do, sir, is assist with the integration of
25 the information in the interrogatory answer into the

1 broader document.

2 Q. Would you agree with me, Mr. Penn,
3 that those could be integrated with those figures, 14.2
4 and 14.5?

5 MR. PENN: A. I don't think I can agree
6 until I understand the sense of the question.

7 What I can say is that figure 14.2
8 contains a listing of all the major supply options that
9 were considered when the DSP was issued in December of
10 1989, and then I can certainly agree that the CANDU
11 options listed in table 3.1 were the subject of a study
12 in a preliminary nuclear option review in order to
13 address what options would be available to Hydro for
14 in-service around 2010, given that the Update moved the
15 requirement for nuclear power to that period, whereas
16 in the DSP it was more in the period of 2003. That I
17 can do, but I don't understand what you mean by
18 integrating the two.

19 Q. The information in Exhibit 3
20 throughout this hearing has been updated periodically,
21 and that's updated with a small "u"; correct?

22 What I am trying to do is I am trying to
23 ensure that the Board when they go back to Exhibit 3
24 have all of the information dealing with major supply
25 options potentially suitable for plans.

1 And as I understood your
2 evidence-in-chief and your evidence under cross-
3 examination, you very much regarded the information in
4 tables 3.1 and 3.2 as dealing with the question of
5 those being major supply options potentially suitable
6 for plans. Wasn't that the context of your evidence?

7 A. They were potential options in
8 nuclear power for the future together with, of course,
9 other advanced light water reactor designs for
10 evolutionary and passive that I listed in my direct
11 evidence.

12 Q. Of course. And those are found
13 actually at table 3.2, are they not?

14 A. Not all of them. In table 3.2 is a
15 listing of the evolutionary CANDU options, plus one
16 illustrative advanced light water reactor known as
17 System 80-Plus. There were in my direct evidence at
18 least six other advanced light water reactors that we
19 considered.

20 Q. That's fine. Perhaps, Mr. Penn, I
21 could take you in the interrogatory, the preliminary
22 nuclear review, to table 4.1, which lists the
23 characteristics of the various CANDU options in the
24 pages following page 13 in the Preliminary Review; is
25 that right?

1 A. Yes, I have that. Yes.

2 Q. All right. And I would ask you the
3 same kind of question.

4 Would you agree that that information
5 could be usefully added as an addenda to figure 14, or
6 I guess it would be after figure 14.19 at page 14.27 in
7 Exhibit 3? It contains the same kind of information as
8 we find in the figures, figure 14.19 at pages 14.26 and
9 14.27, does it not?

10 A. Yes, figure 14.19 describes the
11 characteristics of CANDU options, and that is what
12 table 4.1 describes in this particular exhibit.

13 Q. So if we are updating the Exhibit 3
14 document, then, it would be useful to make a note to
15 add the information in table 4.1 to follow that, would
16 it not, after option 12?

17 A. Where the information is
18 supplementary, yes.

19 Q. All right, sir. And could you just
20 take a moment, Mr. Penn, and scan for me figure 14.19
21 respecting options 11 and 12 and just confirm for me
22 that the information in that chart is correct, with the
23 exception, of course, we know of the LUEC information
24 which has been updated?

25 Other than that, are the characteristics

1 described in figure 14.19 for options 11 and 12, does
2 that information remain current today? And, of course,
3 any other member of the panel, if there is any
4 information that should be corrected I would ask that
5 you bring it to our attention so that we can correct
6 it.

7 A. Well, I have been through option 11.
8 The only comment I would make is that under Flexibility
9 it talks about construction lead times of about five to
10 eight years, and the position that we have established
11 for a future 4 by 881 megawatt station is that the
12 construction period on an existing site would be 72
13 months. We have never said anything less. So I am not
14 quite sure where the 60 months comes from.

15 So with that caveat I would agree with
16 it.

17 Q. All right. And how about option 12?

18 A. Again, apart from levelized unit
19 energy cost which--

20 Q. Which you mentioned.

21 A. --has been updated.

22 Q. So the option 12 information remains
23 current?

24 A. Yes, it does.

25 Q. And I guess, let us not forget the

1 note under the figure on page 14.26, under
2 Characteristics of CANDU Options: Option 12 similar to
3 option 11 except where noted. So I just want to draw
4 that to your attention.

5 I guess the same comments that you
6 made -- we have made the comment about the LUEC. Would
7 the same comment apply with respect to construction
8 lead times or are the lead times of three to five years
9 correct?

10 A. Well, Atomic Energy of Canada Ltd.
11 claim that the construction lead time for a CANDU 3 is
12 38 months, so the answer is "yes".

13 Q. That information is still current?

14 A. Yes.

15 Q. And just one final question before
16 lunch. Could I take you to the system application box
17 under option 11?

18 A. Yes?

19 Q. And Mr. Heintzman had a lot of
20 questions about I think he called it the manoeuvring,
21 the load following capabilities of the 4 by 881 CANDU,
22 and certainly you would agree, then, with the
23 statement - or perhaps, Mr. Daly, to you - with the
24 statement that: It would be suitable for intermediate
25 load, 40 to 60 per cent.

1 That information remains current?

2 MR. DALY: A. Yes. Technically, it can
3 operate at those levels, yes.

4 MR. BULLOCK: Perhaps that would be an
5 appropriate time to break for lunch, Mr. Chairman.

6 My next area deals with a few questions
7 about radiation dose calculations.

8 THE CHAIRMAN: We will break until 2:30.

9 THE REGISTRAR: Please come to order.
10 This hearing will adjourn until 2:30.

11 ---Lunch recess at 12:56 a.m.

12 ---On resuming at 2:30 p.m.

13 THE REGISTRAR: Please come to order.

14 This hearing is again in session. Be seated.

15 THE CHAIRMAN: Mr. Campbell?

16 MR. B. CAMPBELL: Mr. Chairman, my friend
17 and I have had the opportunity to discuss this over the
18 noon hour, we intend to I think continue those
19 discussions and once he and I both have instructions,
20 you may or may not hear from us again.

21 If you don't, then I suppose you are
22 allowed just to be happy about that and, if you do,
23 then there will be question to be decided.

24 But for the time being my friend and I
25 are both quite content to let the matter rest.

1 THE CHAIRMAN: Okay.

2 MR. BULLOCK: We will take a look at the
3 transcript, Mr. Chairman, and see where we are at.

4 THE CHAIRMAN: All right, thank you.

5 MR. BULLOCK: Q. Perhaps we could start
6 then with a few questions about radiation dose
7 calculations, Dr. Whillans, please.

8 If I could take you, sir, to tab 7 of the
9 interrogatories brief, Interrogatory 9.44.7.

10 THE REGISTRAR: That will be 520.48.

11 ---EXHIBIT NO. 520.48: Interrogatory No. 9.44.7.

12 MR. BULLOCK: Q. And as well, Dr.
13 Whillans, please, to tab 8 of the interrogatories
14 brief, Interrogatory 9.44.8.

15 THE REGISTRAR: That will be .49.

16 ---EXHIBIT NO. 520.49: Interrogatory No. 9.44.8.

17 MR. BULLOCK: Q. Now, Dr. Whillans, the
18 first interrogatory deals with the annual radiation
19 dose produced by a normally operating CANDU facility,
20 Pickering, Bruce or Darlington, and how it compares
21 with the naturally occurring background radiation for
22 the average individual in Ontario.

23 If I could take you, please, to Exhibit
24 519, page 28.

25 DR. WHILLANS: A. Yes.

1 Q. That page provides that comparison;
2 does it not, for the average individual?

3 A. Yes, it does.

4 Q. Because we have natural and
5 artificial background radiation in the top part of that
6 table, and then we have nuclear power generation, less
7 than 0.01 millisieverts per year at the bottom; is that
8 correct?

9 A. That's correct.

10 Q. All right. And if I could take you
11 then to the actual interrogatory answer at tab 7,
12 9.44.7, No. 520.48, the first paragraph there:

13 The comparison of the annual
14 radiation doses produced by a normally
15 operating CANDU facility and naturally
16 occurring background radiation is
17 provided in the document Annual Summary
18 and Assessment of Environmental
19 Radiological Data. The latest version of
20 this document is attached.

21 And if you could just flip over the page,
22 a couple of pages, we see that document; do we not,
23 HSD-HP 9120.

24 A. That's right.

25 Q. It's that document; is it not?

1 A. Yes.

2 Q. And I believe that from page 99 of
3 that document, table 7.2.6, you derive your information
4 on page 39 of Exhibit 519, the collective doses; is
5 that right?

6 A. That's correct.

7 Q. Okay. Now, the second paragraph of
8 that answer:

9 Typically the resulting radiation
10 doses to the most exposed members of the
11 public have been less than
12 0.05 millisieverts per annum.

13 The most exposed member of the public is
14 a hypothetical reference person; is it not?

15 A. Yes, it's the most exposed members
16 and this refers to the members of the so-called
17 critical group who are a homogeneous group of
18 individuals who are likely to receive the highest dose
19 as a result of any particular pathway or all pathways.

20 Q. All right. So that would not be the
21 average, Ontario average?

22 A. No, that's not the average.

23 Q. All right.

24 A. I think I mentioned either in direct
25 or in cross-examination that it's probably at least an

1 order of magnitude greater, depending on what you take
2 as the basis for your average.

3 Q. I believe you did. And now, as I
4 understand it, the information about radiation doses
5 should also be read with Exhibit 507; should it not,
6 that is the health report?

7 A. That's right.

8 Q. Could I take you to just two passages
9 in that document, if I could. The first is at page
10 1-2, so that is of Exhibit 507, Mr. Chairman.

11 THE CHAIRMAN: What was the page again,
12 Mr. Bullock?

13 MR. BULLOCK: 1-2, sir.

14 THE CHAIRMAN: Thank you.

15 MR. BULLOCK: Q. The last paragraph, Dr.
16 Whillans, you had referred to at least part of it in
17 prior evidence, but perhaps it deals with this question
18 of comparison of radiation doses with background doses.

19 And could you just read into the record
20 for us, please, that last paragraph, please, and
21 confirm that it's your view.

22 DR. WHILLANS: A. Sources of background
23 exposure to ionizing radiation are listed
24 in Figure 1.1 with their approximate
25 contribution.

1 Q. And that's over the next page, and
2 Mr. Hamer referred to that at length.

3 A. That's right.

4 Radiation dose resulting from
5 radionuclide emissions from nuclear
6 station operation should be compared with
7 the radiation dose received by the
8 public from other sources and to the
9 variability of this background
10 radiation.

11 Q. Would that be to determine what is a
12 meaningful exposure?

13 A. Well, I think the comparison should
14 be made to give perspective, because on the one hand
15 these background doses are virtually unavoidable and,
16 on the other hand, people tend to ignore many of the
17 sources of variability in this background radiation.

18 Q. All right. Could you continue,
19 please?

20 A. Total annual background dose shown
21 in figure 1.1 will vary considerably from
22 individual to individual according to
23 lifestyle, housing type and location,
24 occupation and medical requirements.

25 Q. That very much sums up the various

1 variables that Mr. Hamer and you talked about; is that
2 not correct?

3 A. Those are the main ones, yes.

4 Q. Right.

5 A. Shall I continue, yes?

6 Q. If you could, please. Just read in
7 the rest of the paragraph.

8 A. The radiation dose from cosmic rays
9 depends primarily on altitude, exposure
10 doubling for every 2,000 metres increase
11 in elevation above sea level.
12 This should be fairly constant in
13 Ontario. The dose from terrestrial
14 radiation depends on how much time a
15 person spends outside can vary by 25 per
16 cent. Inhalation of short-lived decay
17 products of Radon 222 is the most
18 significant source of natural background
19 radiation exposure and the most variable
20 (from 0.4 millisieverts per year to 20
21 millisieverts per year; that is minus 80
22 per cent to plus 900 per cent).

23 Q. And I took that to mean in Ontario;
24 is that right?

25 A. Yes, I think this is a reasonable

1 estimate for Ontario. Certainly other parts of the
2 world it could be more than that, quite a lot more.

3 Q. Okay.

4 A. There are few measurements of
5 radionuclides in the body and therefore
6 variability of internal dose has not yet
7 been established. As can be seen from
8 figure 1-1, the contribution from nuclear
9 generation is very small compared to
10 natural and other artificial sources.

11 Q. And just to confirm then that that's
12 your view that the exposures need to be taken in
13 relation to the background exposures; is that fair?

14 A. I think that's a reasonable way to
15 gain perspective on their meaning, yes.

16 Q. All right. And just one more passage
17 in Exhibit 507. If I could take you, please, to page
18 5-11.

19 A. Yes.

20 Q. The second paragraph beginning: "It
21 is possible to calculate..."

22 A. Yes.

23 Q. Could you just read that into the
24 record, please, and confirm that that's your view.

25 A. It is possible to calculate for long-

1 lived and mobile radionuclides a
2 regional and global collective dose
3 assessment and to integrate these doses
4 for future times. However, the
5 individual doses that would be calculated
6 are highly uncertain and exceedingly
7 small. The additional implied health
8 risk would be below any meaningful
9 quantity.

10 There's a reference Ontario Hydro, 1991E.

11 For additional perspective on
12 natural background radiation and
13 the population collective dose due to
14 Ontario Hydro nuclear station emissions,
15 see Ontario Hydro, 1991E, section 7.3.

16 Q. And you can confirm that that's your
17 view then about the effects of regional and global
18 collective doses?

19 A. Yes, that's my view.

20 Q. All right. And that reference there,
21 Ontario Hydro 1991E, that is the document, the report
22 at tab 7 of the interrogatories brief; is it not?

23 A. That's right, that is Exhibit 520.15.

24 Q. Very good.

25 A. Also Interrogatory 9.17.36.

1 Q. All right. And the Board can
2 certainly rely on that document?

3 A. I believe so.

4 DR. CONNELL: If I might just interrupt
5 for a moment.

6 MR. BULLOCK: Certainly.

7 DR. CONNELL: Dr. Whillans, looking again
8 at figure 1-1 on page 1-3 and looking at the list of
9 natural sources, given this admittedly rough estimate
10 of the internal dose suggests to me there might be one
11 element that is missing and that would be the dose that
12 we acquire from others in near proximity, that is, Mr.
13 Johansen sitting very close to you, and you might
14 possibly be getting what .05 of a millisievert? I see
15 you are edging away now.

16 MR. BULLOCK: I guess it would depend
17 where Mr. Johansen had lunch.

18 DR. WHILLANS: Well, I can't be sure
19 about the .05 but it's probably quite small. The main
20 source of internal contamination is, as I said, K40 and
21 that's approximately half. That has a fairly energetic
22 gamma ray, so he's emitting radiation in all
23 directions. Now, I think the main thing is just the
24 sort of geometric factor here.

25 DR. CONNELL: Yes.

1 DR. WHILLANS: But it would be -- and the
2 time spent sitting beside him I guess. It would be a
3 small fraction of the .39, so it may be .01 or
4 something if we sat like this for most of the year.

5 DR. BULLOCK: Q. For weeks, Dr.
6 Whillans?

7 DR. WHILLANS: A. Weeks or months, yes.

8 DR. CONNELL: But still probably much
9 larger than the numbers in the bottom section of the
10 table.

11 DR. WHILLANS: Yes. I think if we sat
12 like this every day of the year I would think I would
13 receive more exposure than I would from the emissions
14 at the bottom of the table.

15 DR. CONNELL: Yes.

16 DR. WHILLANS: I think that's probably
17 true.

18 DR. CONNELL: Thank you.

19 MR. BULLOCK: Q. And when you say the
20 emissions at the bottom of the table, Dr. Whillans, you
21 are speaking of nuclear power generation?

22 DR. WHILLANS: A. That's right.

23 Q. The figures at the bottom of page 28?

24 A. Yes, that's right.

25 Q. Okay. And perhaps we can go through

1 this fairly quickly, Dr. Whillans.

2 I was hoping that - and I have provided
3 you with a sheet with the calculations - I was hoping
4 that we might calculate the average individual's dose
5 from the data, the collective dose data on page 39.

6 I had a little bit of trouble, I must
7 confess, following your evidence in chief about this,
8 so I took the liberty of preparing this calculation
9 sheet.

10 MR. BULLOCK: And perhaps we could have
11 the radiation dose calculation sheet made the next
12 exhibit, Mr. Chairman.

13 THE CHAIRMAN: Yes.

14 THE REGISTRAR: That will be No. 573.

15 --EXHIBIT NO. 573: Radiation Dose Calculation Sheet.

16 MR. BULLOCK: Q. You have a copy; do
17 you, Dr. Whillans?

18 DR. WHILLANS: A. I do.

19 Q. And we can calculate average
20 individual dose; can we not, from the collective dose
21 indicated on page 39 of Exhibit 519?

22 A. Yes.

23 Q. And looking at the radiation dose
24 calculation sheet Exhibit 573, item No. 1, would that
25 be the formula for doing that calculation, average dose

1 in millisieverts per year would equal the collective
2 dose in person-sieverts multiplied by 1,000 to bring us
3 to the units, millisieverts, and divided by the number
4 of persons in the population?

5 A. Yes. The only uncertainty would be
6 what you chose as the number of persons in the
7 population.

8 Q. Certainly.

9 A. But the formula is correct.

10 Q. Okay. And I believe you said in your
11 evidence in chief that you had at -- for instance,
12 Pickering, you would done the calculation based upon a
13 population of approximately 3 million persons; isn't
14 that right?

15 A. I think I did say that. That number
16 is obviously fairly rough. With reference to the
17 Environmental Assessment Report, we were just talking
18 about, it tells you that these dose calculations are
19 carried out for Pickering to a distance of about 30
20 kilometres, so that goes through a fair fraction of
21 Toronto but not all of it, so it might be 2 million
22 rather than 3 million.

23 Q. Okay. And why is it done to the 30
24 kilometre radius?

25 A. The collective dose calculations that

1 are done in our reports are done out to a distance at
2 which the individual dose is 1 per cent of the dose
3 that would be received by someone on the boundary fence
4 let us say, so the highest dose, so 1 per cent of the
5 highest, and beyond that we believe the uncertainty in
6 estimating is so great that we don't include those in
7 our local collective dose calculation.

8 Q. It becomes not a meaningful number?

9 A. The 30 kilometres is with reference
10 to airborne, and I believe it tells you that the
11 calculation with respect to waterborne is to any
12 population served by a water intake within, I think, 25
13 kilometres. So it's roughly that area.

14 Q. Because beyond that radius the
15 uncertainty factor is simply too great; isn't that
16 right?

17 A. And we can't, in many cases, measure
18 the activity, so it's based strictly on calculation.
19 It becomes very uncertain.

20 Q. So it would be undetectable beyond
21 that radius; is that right?

22 A. Generally.

23 Q. Virtually.

24 A. Generally, yes. For most nuclides
25 that would be true, yes.

1 Q. All right. And so can we just look
2 at the formula then and look at the data on page 39 of
3 Exhibit 519.

4 And if we were to calculate the average
5 individual dose then for someone in the Pickering area,
6 should we be adding in the Darlington emissions as
7 well?

8 A. Well now, you are basing your
9 calculation on this page 39.

10 Q. Correct.

11 A. Which is the total collective dose
12 for all the Hydro stations.

13 Q. That's right.

14 A. And you can see that Pickering is
15 1.45 of the 1.75, it's the major source.

16 Q. Right.

17 A. Darlington is less than 10 per cent,
18 so it doesn't really matter very much.

19 Q. What I would like to do is, I would
20 like to do it for the population affected by Darlington
21 and Pickering. So, for instance, essentially the
22 greater Toronto area.

23 A. Okay.

24 Q. That's what I'm after.

25 A. Yes.

1 Q. So I take it then that we could leave
2 the Bruce emissions out; could we not?

3 A. Yes, we could.

4 Q. Would that be appropriate?

5 A. For that population, yes. In fact,
6 there were environmental measurements done at
7 Darlington in the year particularly before startup.

8 Q. Right.

9 A. And all of the activity above normal
10 background there would be due only to the effect of
11 Pickering, which is some distance away. So those
12 numbers give us some idea that the contribution of
13 Pickering to the immediate Darlington area is very,
14 very small.

15 Bruce would be probably unmeasurable.

16 Q. Okay. And just to take us through
17 the calculation then, what we would add then would be,
18 looking in the right-hand column, Mr. Chairman, you
19 would add .124 to 1.45; would we not?

20 A. Yes.

21 Q. Now, we are trying to find the
22 average individual dose in the, call it the Greater
23 Pickering area.

24 A. Yes.

25 Q. And we would multiply that by 1,000.

1 A. Yes.

2 Q. And then we divide by, I think your
3 evidence in chief as I said was approximately 3
4 million.

5 A. All right.

6 Q. Give or take. And in fact I have a
7 reference for you and the volume if you would like me
8 to take you to it.

9 A. No, no, that is fine. I mean, as I
10 say, that's a fairly rough number, but these numbers
11 are not precise anyway.

12 Q. Sure. And if we work that out, the
13 figure that I get is 0.00052 millisieverts per annum
14 average individual dose in the greater Pickering area.

15 A. Would you repeat that, please?

16 [2:50 p.m.]

17 Q. Certainly. 0.00052 millisieverts per
18 annum in the Greater Pickering Area, that's the average
19 individual dose? Is that math right?

20 A. I think that's correct, yes.

21 Q. And so if we just flip back, then, to
22 page 28, and again, I think in your evidence you have
23 been very careful to always say 'less than 0.01', but
24 we are talking about a number that, would you agree
25 with me, is substantially less than 0.01 millisieverts

1 per annum when we are talking about the radiation
2 exposure from nuclear power generation - several orders
3 of magnitude less; isn't that right?

4 A. Yes. As I say, I think others might
5 feel that it is perhaps not reasonable to take a
6 population as large as 3 million.

7 On the other hand, if you want to look at
8 the contribution of this source to the population of
9 Ontario you would take a bigger number. So it
10 certainly is less than .01, and, as you say, if you
11 take a population of that size it could be much less.

12 Q. But the 3 million was the figure that
13 you used in your evidence in chief, was it not, when --

14 A. Yes, I believe that's right.

15 Q. And in your view, that is an
16 appropriate population number to take, is it not?

17 A. Yes, it is consistent with the
18 population to which we calculated the collective dose,
19 yes.

20 THE CHAIRMAN: I am a little confused,
21 and perhaps I shouldn't...

22 But if there were only 10 people in the
23 area of the plant as opposed to 3 million people that
24 there would be a much, much greater average dose? Is
25 that valid?

1 DR. WHILLANS: No, I think that isn't
2 right.

3 THE CHAIRMAN: Isn't that what --

4 DR. WHILLANS: It's because the
5 collective dose would not be so high.

6 THE CHAIRMAN: Pardon?

7 DR. WHILLANS: It's because the
8 collective dose that we are using here would not be so
9 high.

10 We are doing a bit of a circular exercise
11 here because the way the collective dose was calculated
12 was to estimate doses to groups of individuals all
13 throughout this 30 kilometre area and then add them all
14 up, and if there were only 10 people there wouldn't be
15 very many -- you know, given that the maximum dose to
16 any individual is .05 millisieverts, it couldn't be
17 worse than .5 millisieverts, rather than 1.75 sieverts.

18 So the collective dose would be much
19 smaller if there were a small number of people.

20 When I say it's bit of a circular
21 exercise, the direct method is to add up the dosage for
22 all those people. When you are doing that you could
23 average it right away, and I think that is essentially
24 what we are doing now.

25 But I guess what is misleading is the

1 fact that this collective dose depends very much on
2 having 3 million people in the area. That is why the
3 contribution from Bruce is so much smaller. You know,
4 it is approximately the same size of facility; the
5 population is very much smaller.

6 THE CHAIRMAN: Well, then, what is the
7 significance in the matter that we are considering of
8 the average dose? What significance does that have?

9 DR. WHILLANS: Well, perhaps Mr. Bullock
10 could tell you why he wanted to do the calculation,
11 but -- well, I suspect it is to give you this
12 comparison.

13 I think we focus more on the critical
14 group dose, and I have tried to say this is the
15 critical group dose, it is a probably conservative
16 estimate of the most that anyone would receive as a
17 result of the emissions, and I believe Mr. Bullock
18 probably wants to emphasize that the average for any
19 population in the nearby area, say within 30
20 kilometres, is very much less than that.

21 It is very heavily influenced by the
22 doses that are received at the boundary fence, as they
23 say, or by people living in the immediate vicinity, and
24 those doses are all less than 1 per cent of the dose
25 limit. So the rest of this 3 million population

1 doesn't add much to the collective dose.

2 MR. BULLOCK: That is the point, Mr.
3 Chairman. The interrogatory answer talks about the
4 radiation dose received by the most exposed member, and
5 the point is that the average, even in an area with a
6 very large population like the Greater Pickering Area,
7 would be very, very much less than that figure. That
8 is the point.

9 Q. I think the collective dose, sir,
10 with respect to that is, the collective dose is very
11 much a function both of the -- call it the absolute
12 radiation levels generated as well as the population
13 because, as I understand it, Dr. Whillans, what you
14 then do is you sum the radiation exposure over the
15 population. So if you have a high population all other
16 things being equal you are going to have a high
17 collective dose; correct?

18 DR. WHILLANS: A. That's right. That's
19 right.

20 MR. BULLOCK: Does that help, Mr.
21 Chairman?

22 DR. WHILLANS: We went through that
23 exercise for several critical groups on page 38 of
24 Exhibit 519. You may recall we showed there the
25 various contributions to critical groups.

1 We had three critical groups, and the
2 exercise there was for each of these groups to sum up
3 the amount to estimate what the dose to that critical
4 group might be.

5 Well, the extension of that is just to
6 now look at other groups than critical groups,
7 everybody in the local area, and add up their doses,
8 and that is what gives you the collective dose. I
9 think Mr. Bullock is making the point that the things
10 you start adding beyond these critical groups are very,
11 very small, so that the average becomes much smaller
12 than .05.

13 MR. BULLOCK: Q. Thank you, Dr.
14 Whillans. Perhaps we could just proceed on, then.

15 In your evidence in chief you had done
16 what I would call a risk conversion calculation using
17 some information on page 30 of Exhibit 519; is that
18 correct?

19 DR. WHILLANS: A. Yes.

20 Q. And if I could just take you, please,
21 to Volume 121 of the transcript, Volume 121, page
22 21214.

23 A. 214?

24 , Q. 21214.

25 A. I have it.

1 Q. Just before we get into the risk
2 conversion calculations, because, again, when I heard
3 your evidence in chief I had a little bit of trouble
4 understanding the calculation until I went back and
5 considered the transcript, and on page 21214, starting
6 at line 19, your evidence was:

7 The number of fatal cancers that would
8 be expected to occur as a result of other
9 causes over the lifetimes of a population
10 of this size is about one thousand.

11 Now, a couple of points there. One is
12 that when you are talking about cancers as a result of
13 other causes you are talking about causes other than
14 exposure to the radiation from nuclear generation;
15 isn't that right?

16 A. Well, on this page we were talking
17 about occupational doses.

18 Q. Right. I am coming to that.

19 A. Okay.

20 Q. But that is what you were talking
21 about; right? You were talking about cancers caused by
22 other than exposure to nuclear power generation, would
23 be about 1,000 in a population of 5,000 if we look at
24 the previous paragraph?

25 A. That's right. The average cancer

1 mortality in Canada is about 20 per cent.

2 Q. Is about 20 per cent. All right.

3 And I have provided you with a copy, Dr.
4 Whillans, of an article in the Nuclear Journal of
5 Canada. And perhaps, Mr. Lucas, if you could
6 distribute that to the Panel, and I have the original
7 journal here, Mr. Chairman, if you would like it to be
8 filed, as you wish.

9 THE CHAIRMAN: We will file the copies.
10 That should be sufficient.

11 THE REGISTRAR: This will be No. 574, Mr.
12 Chairman.

13 THE CHAIRMAN: Are these extracts you are
14 filing?

15 MR. BULLOCK: They are, sir.

16 THE CHAIRMAN: Then perhaps you should
17 file the whole thing.

18 MR. BULLOCK: I certainly will.

19 ---EXHIBIT NO. 574: Article in the Nuclear Journal of
20 Canada.

21 MR. BULLOCK: Q. So for reference, Mr.
22 Chairman, this is an article found at page 14 of the
23 Nuclear Journal of Canada, Volume 1, No. 1, dated
24 March, 1987. It is an article entitled "A Review of
25 the Health Effects of Energy Development", and it is

1 authored by a D.K. Myers and an M.M. Werner.

2 I would like to take you, Dr. Whillans,
3 please, to page 15 of that article, table 1. It is a
4 table, Dr. Whillans, as you can see, entitled:
5 Immediate Causes of Death in Canada, 1983.

6 Do you have it, sir?

7 DR. WHILLANS: A. I do.

8 Q. And could you explain for the Board
9 what this kind of table, the kind of information that
10 it shows, illustrates?

11 A. Well, this table summarizes the
12 immediate causes of death in Canada for the year 1983,
13 and it does it by listing for each of a number of
14 different major cause groups what they call the
15 standardized death rate per 100,000 for males or for
16 females, and then it sums this for each.

17 It also shows on the right-hand column
18 the relative importance of the different groups by
19 calculating the percentage of the total. The
20 percentage adds to 100 per cent.

21 Q. So, for instance, in 1983
22 approximately 3.5 per cent of deaths were caused by
23 pneumonia, influenza and tuberculosis; is that correct?

24 A. Yes, that is what it says.

25 Q. And to get the number of deaths per

1 100,000 of population you would sum, then, 22.4 and
2 18.8, isn't that right, in the first line there?

3 A. I think actually, the 22.4 refers to
4 100,000 and the 18.8 refers to 100,000. So I think you
5 would average them.

6 Q. Is that right?

7 A. Well, I didn't construct the table.

8 Q. Certainly.

9 A. But generally speaking, the way a
10 table would be set up would be that each number would
11 be per 100,000.

12 Q. Okay. And to get an idea, then, this
13 shows that the percent of deaths from all cancers - in
14 other words, lung cancer and other cancers - in 1983 at
15 least, would have been 24.8 per cent; is that right?

16 A. That's right.

17 Q. And you mentioned the figure of 20.
18 Would the data in this table be of the right order of
19 magnitude today?

20 A. I have seen, I think, the 1991
21 Canadian numbers. There is a difference between males
22 and females, and the differences are sort of 21 per
23 cent versus 24, and they probably have improved a bit
24 since 1983. So I think this is reasonable.

25 Q. So these are of the right order,

1 then?

2 A. Yes.

3 Q. All right. And what I would like to
4 do then, Dr. Whillans, if we could, is take the Greater
5 Pickering Area population of approximately 3 million
6 and calculate the expected annual cancer deaths, if we
7 could.

8 Perhaps we could just take a moment and
9 do that, and we would average the rates, would we not,
10 for male and female? Isn't that what you said?

11 A. That is what I said.

12 Q. And perhaps we can do it subject to
13 checking. I believe that you add the two figures
14 together.

15 A. Well, you may have information I
16 don't have or you may know more about the table. We
17 are talking about a factor of 2.

18 THE CHAIRMAN: Well, perhaps one support
19 for that would be the totals at the bottom because it
20 indicates if it was 100,000 each that 706,000 males die
21 in 1983 per 100,000 against 486 females. That doesn't
22 seem -- does that seem right to you?

23 MR. BULLOCK: That's right.

24 DR. WHILLANS: You mean...

25 MR. BULLOCK: Q. I believe what the

1 Chairman is saying is to get the deaths per 100,000--

2 DR. WHILLANS: A. Yes?

3 Q. --you sum the male and female
4 columns?

5 A. That could be true.

6 Q. Well, presuming that is true --

7 A. When I looked at the table -- I tell
8 you why I am not arguing very strenuously.

9 When I looked at the table I noticed
10 that, for instance, for males the total was 700 per
11 100,000, and if you work out what the average survival
12 time will be that is 140 years or something. So that
13 suggests that what you are saying is correct.

14 However, the reason I am not agreeing
15 quickly is because -- I notice the same thing in the
16 tables that I was just referring to, the 1991 cancer
17 statistics, and I talked to Dr. McLaughlin at the
18 Cancer Centre about it and he had some explanation for
19 why my conclusion was incorrect, so--

20 Q. Well, subject to checking--

21 A. --subject to checking --

22 Q. --we will presume that we add the two
23 columns together.

24 A. Okay.

25 Q. So then, the deaths for all cancers I

1 made it to be -- if we sum, then, the lung cancer
2 deaths for male and female and the other cancer deaths
3 for male and female I made the total to be 295.6 in
4 100,000 population in a year; is that right?

5 A. I am happy to take your number, or
6 you can give me a minute to add them up.

7 Q. Sure.

8 A. Which?

9 Q. I will give you a minute to add them
10 up, and I am happy to proffer my calculator if you
11 would like it.

12 A. Well...

13 Q. Mine is solar powered, by the way.

14 A. Did you say 293?

15 Q. I said 295.6.

16 A. 295.6. Okay. Well, that is
17 certainly close enough.

18 Q. Very good. And to calculate it,
19 then, the expected cancer deaths over the 3 million
20 population the calculation would be 3 million times
21 295.6 divided by 100,000; correct?

22 A. Correct.

23 Q. And I make that to be 8,868 persons,
24 deaths.

25 A. Yes, I agree.

1 Q. All right. And I would like to take
2 you, Dr. Whillans, then to Exhibit 573, and what I
3 would like to do is I would like to calculate the risk
4 estimate because it is just an estimate - let us not
5 lose track of that - for a member of the public so the
6 risk estimate for a member of the public of an induced
7 cancer, because that is what your table -- at least the
8 first heading on page 30 under the heading Cancer,
9 Public, ICRP 1991, 5 per cent, that is what that
10 calculates, does it not, the risk estimate of an
11 induced cancer--

12 A. That's right.

13 Q. --in a member of the public?

14 A. That's right.

15 Q. Is that right?

16 A. Yes, that's right.

17 Q. Okay. And could you just confirm
18 that my formula at No. 2, item 2, on Exhibit 573 is
19 correct? The risk estimate would be the collective
20 dose from page 39 multiplied by the risk percentage
21 figures that you have on page 30, and I have used, as I
22 said, the ICRP 1991 figures for my calculations. Is
23 that right?

24 A. I am happy with the next line. I am
25 not sure I would choose those words to describe them,

1 but yes, that's fine.

2 Q. My layman's language.

3 A. Well... Yes, okay. I am happy with
4 the sense in which you are doing it, yes.

5 Q. All right. And if we could keep one
6 finger at page 30 and flip over to page 39 then, we
7 can, can we not, take the 1.75 person-sieverts and use
8 the 5 per cent risk estimate percentage from page 30
9 and arrive at the figure 0.088 estimated induced
10 cancers in a year?

11 A. We were doing this calculation just
12 for the Pickering area before. You want to now move to
13 all of Ontario?

14 Q. Let us use the total. Let us be
15 conservative.

16 A. Okay. Yes. Then, that's fine.

17 Q. All right? I believe that in your
18 evidence you had rounded upwards and you had said 0.01
19 induced cancers per annum.

20 A. 0.1.

21 Q. 0.1. And just a reference for the
22 record, I believe that can be found at Volume 121, page
23 21,230.

24 [3:10 p.m.]

25 Do you just want to take a minute and

1 check that, Dr. Whillans.

2 A. Yes, that's found in the sentence
3 beginning on line 18.

4 Q. All right, thank you. And that's in
5 fact where the formula is taken from. So what that
6 means then, as I understand it, is that in a given year
7 where one could expect something of the order of 8,868
8 persons to die of cancer, there is an induced cancer
9 that the - maybe I'm stating this poorly - but when you
10 compare in a year where 8,868 persons could be expected
11 to die of cancer the contribution, if you will, from
12 the exposure to radiation for nuclear power generation,
13 there would be 0.088 of those deaths, of those 8,868
14 deaths could be attributed to that radiation exposure;
15 is that right?

16 A. Well, not quite. The 0.088 are
17 induced cancers.

18 Q. Right.

19 A. And they are going to occur over the
20 next 50, 70 years.

21 Q. Right.

22 A. During the remaining lifetimes of the
23 people who are exposed.

24 Q. Right.

25 A. And you are comparing those with the

1 8,868 that died of cancer in that population that year.

2 Q. Right.

3 A. So --

4 Q. Well, in any given --

5 A. You are not exactly comparing the
6 same population. I guess what I think I had said was
7 the emissions may induce .1 fatal cancers some time
8 during the following lifetime.

9 Q. Right.

10 A. And that could be compared with an
11 annual cancer fatality rate which is similar to what
12 you are quoting.

13 Q. That's what I'm trying to get at.

14 A. But I think the distinction is that
15 only if you consider basically an equilibrium situation
16 where you have been exposing the population for a long
17 time, could you really be saying that that small
18 contribution would be part of the group that you are
19 talking about.

20 Q. So it's probably less than that?

21 A. Well, it's not so much the numbers,
22 it's just the fact that that .1 will occur over the
23 remaining lifetimes and it's unlikely to occur at all
24 for at least say five years. So in that particular
25 year there won't be any.

1 I'm not objecting to what you say, I was
2 just making the distinction that you are comparing an
3 annual fatality rate with a rate of induced cancer
4 which is going to occur over the rest of the lifetime.

5 So if that station operated for only the
6 one year, you would really want to compare it with
7 maybe 50 times 8,868. However, since it is operating
8 continuously, what you are suggesting is not
9 unreasonable.

10 Q. But from a perspective, from a
11 question of perspective it's a legitimate comparison;
12 would you not agree?

13 A. Yes.

14 Q. To try and get a sense of what we are
15 talking about?

16 A. I think it's similar to the
17 comparison that I was making with the occupational
18 exposure of the 5,000 workers.

19 Q. Let us not forget that we are talking
20 about risk estimates; aren't we?

21 A. Yes.

22 Q. So there is an uncertainty factor
23 involved as well; correct?

24 A. Yes, very much so.

25 Q. And now what I have done with the

1 third item on Exhibit 573, Dr. Whillans, is just
2 convert that risk calculation to a figure 1 in. I
3 found that easier to my mind to understand, and I
4 believe my friend Mr. Hamer took you through various
5 articles where this kind of risk expressed in those
6 terms was summarized.

7 I wanted to just use the figures that we
8 had in Exhibit 519 and come up with that number. And,
9 again, keeping in mind that it's a risk estimate, would
10 you agree that that formula is shown at No. 3 on
11 Exhibit 573? Is that the way that you would calculate
12 that 1 in (a)--

13 A. Yes.

14 Q. --units?

15 A. Yes.

16 Q. So when we do the arithmetic then, it
17 works out to be a risk of 1 in 34 million; would you
18 agree that --

19 A. Yes, I won't trust my calculator this
20 time, but .1 in 3 million is 1 in roughly 30 million,
21 so I'll agree with you.

22 Q. All right. What I'm trying to do,
23 Dr. Whillans, is just again, it's hard when we talk
24 about the risk of being struck by lightening as 1 in 2
25 million, I think was the evidence, it was hard for me

1 to put the numbers from Exhibit 519 into perspective
2 without these kinds of calculations.

3 Perhaps I could move on then to just wrap
4 up on some of the questions about radiation exposure,
5 and if I can take you, please --

6 MR. KING: Mr. Bullock?

7 Q. Yes.

8 A. If I could add something here.

9 Q. Certainly.

10 A. Dr. Whillans had some concerns
11 regarding table 1 in the bulletin article, the CNS
12 bulletin article about the 295, the sum.

13 Q. The Myers article?

14 A. Yes.

15 Q. Yes.

16 A. And what you have done there is you
17 have added the male and female sources or the rates per
18 100,000 to get the 295; right?

19 Q. That's what we have done.

20 A. But then it's per 200,000, so you
21 have to divide it by 2 to get it down to the rate per
22 100,000.

23 Q. Well, perhaps what we could do is we
24 could --

25 A. So...

1 DR. WHILLANS: A. I think our
2 discussions centered around whether the line under the
3 title standardized death rates per 100,000 covering
4 both male and female meant that they had done what I
5 would think is sort of a non-standard way of presenting
6 it, but can certainly check it.

7 Q. I believe you do them together, Mr.
8 King, but we can certainly check it, and the factor of
9 2, as Dr. Whillans pointed out, is the correct one to
10 use, if that's the case?

11 A. Well, the rates per 100,000 for
12 cancer in society, total rates have never been as high
13 as 295. I'm familiar with these calculations.

14 Q. That's your understanding.

15 A. Because for the same sort of reason
16 why you are getting at, is in comparing accident risks
17 to the background risks of cancer in society - in fact
18 I have all the statistics here for many years - and the
19 background rates are never as high as 295 per 100,000.
20 This was a 1982 article.

21 Q. 1987 article, I believe.

22 A. No, the rates are 198 --

23 Q. Stats Can 1985, I believe.

24 A. Yes, but that's reporting statistics
25 from years before.

1 Q. Certainly.

2 A. So it's 1983. So the rates are all
3 under 200 per year.

4 Q. All right. Perhaps you have some
5 numbers. Perhaps you could help us with the numbers.

6 A. Well, the rates for all cancers 1986
7 is the latest I have is 187.5.

8 Q. 187.5.

9 A. This is rates per 100,000 and that's
10 a mixed population, male and female.

11 Q. I'm sorry, the number again?

12 A. 187.5.

13 Q. 187.5. All right. Well --

14 A. These are Statistics Canada mortality
15 tables which are current.

16 Q. How would that affect the calculation
17 of the risk then, is it just a question of dividing by
18 2?

19 A. That's right. In your population of
20 3 million then you would be down at 4,000 some odd
21 background cancer deaths, rather than the 8,000 number
22 you had used.

23 Q. Right. It wouldn't affect the 1 in
24 34 million calculation; would it? Do you want to have
25 a look at Exhibit 573?

1 A. That isn't based on background,
2 that's based on the releases.

3 Q. Right. So the 1 in 34 million
4 calculation is correct, even presuming that the
5 information that you have provided is correct?

6 A. Well, my understanding, the
7 background rate has nothing to do with that
8 calculation.

9 Q. So it wouldn't change?

10 A. No.

11 Q. And with respect to the other rate
12 then, we are talking about a number, I think you said
13 of the order of 4 to 5,000 instead of 8,000; is that
14 right?

15 A. Yes I believe so.

16 Q. All right.

17 A. In that population of 3 million.

18 Q. But for comparison purposes then if
19 we use -- we are still talking the same orders of
20 magnitude; are we not?

21 A. That's right.

22 Q. Okay. Perhaps we could go on, Dr.
23 Whillans, and did anyone else have anything to add to
24 the radiation discussion.

25 Thank you, Mr. King.

1 Perhaps, Dr. Whillans, tab 12, of the
2 interrogatories brief and that is Interrogatory
3 9.44.12, Mr. Chairman.

4 THE REGISTRAR: Which will be .50, Mr.
5 Chairman.

6 ---EXHIBIT NO. 520.50: Interrogatory No. 9.44.12.

7 THE CHAIRMAN: Thank you.

8 MR. BULLOCK: Q. Perhaps, Dr. Whillans,
9 or Mr. King, you could just review that interrogatory
10 which is:

11 How does Ontario Hydro's record of
12 actual emissions relate to its historic
13 current radiation dosage standards.

14 Would you just review that answer and
15 confirm that it's accurate, either of you, or someone
16 else.

17 DR. WHILLANS: A. Well, I'm happy with
18 it. Perhaps Mr. Johansen would like to comment.

19 Q. Is that accurate, Mr. Johansen?

20 MR. JOHANSEN: A. It's generally
21 accurate. Perhaps to be perfectly complete here we
22 could simply note that as we provided in the response
23 to Interrogatory 9.2.4, I believe it was, in the first
24 two to three years of operation of the A plants and the
25 A plants only, there were slight exceedances of the 1

1 per cent operating target, but apart from that it's a
2 good statement.

3 Q. All right. So with that
4 qualification then it's accurate today?

5 A. That's right.

6 Q. Okay. Could we move then to tab 13
7 of the interrogatories brief, please, and that is
8 Interrogatory 9.44.13.

9 THE REGISTRAR: .51.

10 ---EXHIBIT NO. 520.51: Interrogatory No. 9.44.13.

11 MR. BULLOCK: Q. And the interrogatory,
12 Dr. Whillans, was:

13 Do Ontario Hydro's nuclear
14 employees exhibit any unusual or abnormal
15 health problems that may be attributable
16 to exposure to radiation?

17 And the answer is:

18 Ontario Hydro's nuclear workers do
19 not exhibit any unusual or abnormal
20 health problems detected by various
21 monitoring methods. Measures such as
22 sick leave usage, fatal accident
23 frequency, disabling accident frequency
24 and severity generally show nuclear
25 workers to be better than the corporate

1 average.

2 And then the second paragraph:

3 In the case of occupational
4 disease, nuclear workers to date appear
5 to be in better condition than other
6 Ontario Hydro workers. The latest annual
7 report of our ongoing epidemiological
8 study, Ontario Hydro Mortality 1970-1988
9 is attached in response to interrogatory
10 9.22.32.

11 And apart from my pronunciation
12 difficulties, is that information current and accurate
13 today?

14 DR. WHILLANS: A. I believe so, yes.

15 Q. I have a question for you about the
16 comparison to the Ontario Hydro corporate averages.
17 Would that correct for this healthy worker effect that
18 we were hearing about, because you would be comparing
19 healthy workers and healthy workers; wouldn't you?

20 A. That's right. Yes, it does correct
21 in the right direction, yes.

22 Q. All right. So perhaps this
23 information in response to this interrogatory is
24 perhaps somewhat more helpful than the comparisons to
25 the general population; would that be fair?

1 A. Yes.

2 Q. Okay. And in your evidence in chief,
3 just taking you now to the Jablon study--

4 A. Yes.

5 Q. --Dr. Whillans, in your evidence in
6 chief at Volume 121, page 21236, you mentioned a study
7 by I believe it's a Dr. Jablon; is that right?

8 A. Yes, Seymour Jablon, yes.

9 Q. And he did work for the American
10 National Cancer Institute; isn't that right?

11 A. That's right.

12 MR. BULLOCK: Perhaps, Mr. Lucas, if you
13 could distribute the CCH article. Do you have
14 sufficient copies? Yes, please.

15 THE REGISTRAR: Exhibit No. 575.

16 ---EXHIBIT NO. 575: Article entitled: Major U.S.
17 Study Finds No Rise in Cancer Near
18 Nuclear Plants found at page 3593 of CCH
Environmental Control Newsletter No. 435,
May 2nd, 1991.

19 MR. BULLOCK: So just for the record,
20 Mr. Chairman, Exhibit 575 is an article entitled:
21 Major U.S. Study Finds No Rise in Cancer Near Nuclear
22 Plants. It's found at page 3593 of the CCH
23 Environmental Control Newsletter No. 435, May 2nd,
24 1991.

25 Q. Have you had an opportunity, Dr.

1 Whillans, to review that article at page 3593?

2 DR. WHILLANS: A. You are talking about
3 the primary source that's referenced here, right?

4 Q. Yes. If I can take you to --

5 A. Jablon's article you are talking
6 about?

7 Q. That's right.

8 A. Yes, I have it.

9 Q. So page 3593 of Exhibit 575, do you
10 have that in front of you?

11 A. I do.

12 Q. All right. And you see the article
13 entitled: Major U.S. Study Finds No Rise in Cancer
14 Near Nuclear Plants.

15 A. Yes.

16 Q. Do you see that title?

17 A. Yes, I do.

18 Q. And it talks about:

19 A two-year study by the National
20 Cancer Institute (NCI) has found no
21 evidence of any excess occurrence of
22 cancer among people living in counties
23 which have or are adjacent to nuclear
24 facilities in the United States.

25 Is that correct; that's what it reads

1 there?

2 A. That's what it says, yes.

3 Q. And this is Jablon's work; is it not?

4 A. That's right.

5 Q. And perhaps I could just have you
6 continue on with that paragraph, if I could.

7 The study, Cancer in Populations
8 Living Near Nuclear Facilities, was the
9 most comprehensive of its kind ever
10 conducted and the broadest in scope.
11 Would you agree with that appraisal of
12 Jablon's work?

13 A. I guess comprehensive in the sense
14 that it looked at essentially all the nuclear
15 facilities in the entire country. I'm hesitating
16 because I think we should realize that this was what's
17 called a descriptive study, they looked at the national
18 records that are available and compared counties that
19 had nuclear facilities and ones that didn't, and in
20 that sense it was very broad in scope and
21 comprehensive.

22 Its weakness is that it is what is called
23 a descriptive study so that you can't focus, for
24 example, on the people living right next to the plants,
25 it has to look at a population level.

1 So I think that's my only hesitation in
2 saying comprehensive. It had some limitations because
3 it was a large descriptive study.

4 Q. But certainly it didn't have the
5 sources restriction, or sources concerns that you would
6 have had about the Russian studies, for instance;
7 certainly you don't have any concerns about the sources
8 for the Jablon study?

9 A. You mean the sources for the data?

10 Q. That's correct?

11 A. No, those are good sources.

12 Q. And certainly the next line:

13 The NCI evaluated mortality
14 from 16 types of cancer in 107 counties
15 and 34 states. The counties were those
16 which host or are near all 62 major
17 nuclear facilities in the U.S. that are
18 or once were in operation and which
19 started up before 1982.

20 Certainly that suggests that it's
21 comprehensive in the sense of studying all of the
22 sites; is that fair?

23 A. That's right.

24 Q. And could you just read us the second
25 paragraph then and confirm that that's your

1 understanding of Jablon's findings as well?

2 A. Overall cancer mortality was no
3 higher in the studied counties than in a
4 control group of 292 similar counties
5 without nuclear facilities. The NCI
6 noted particularly that compared to the
7 control counties mortality risk from
8 leukaemia and childhood leukaemia was
9 actually lower overall in the study
10 counties in the years after the facility
11 started up.

12 Q. And is that your understanding of
13 Jablon's findings?

14 A. Generally yes. I haven't had a
15 chance to refer back to the paper which I have here, if
16 you would like me to check, but certainly in general
17 that was my understanding, yes.

18 Q. All right. And can we just flip over
19 the page then, and perhaps we could deal with the first
20 two paragraphs.

21 If you could just read those into the
22 record and confirm again that that's your understanding
23 of Jablon's findings.

24 A. The NCI emphasized the data for
25 leukaemia because it has a short latency

1 period, about five years on average. It
2 has been associated in the past with
3 exposure to radiation, although only in
4 large doses."

5 Q. So that's the information about, the
6 mortality risk from leukaemia and childhood leukaemia
7 is actually lower overall, that's what they are
8 referring to; is it? Not.

9 A. That's what it says, yes.

10 Q. Right. Sorry to interrupt.

11 A. No adverse health effects have been
12 demonstrated from exposures below 10
13 rem--, that's 100 milliSieverts in units
14 we have been using.

15 Q. Right.

16 A. --a level thousands of times
17 greater than the maximum permitted by the
18 Nuclear Regulatory Commission for a
19 hypothetical person standing 24 hours a
20 day at the fence post of a nuclear energy
21 plant for an entire year.

22 Q. Is that the most exposed person? Is
23 that roughly the same as the most exposed person?

24 A. Yes, yes.

25 Q. All right.

1 A. Do you want me to carry on?

2 Q. If you could.

3 A. Or comment on that paragraph?

4 Q. Just the last two paragraphs, please.

5 A. All right.

6 Q. If you feel compelled to comment, I
7 certainly would not want to prevent that.

8 A. I'm looking at the comment that 10
9 rem is a level thousands of times greater than the
10 emissions by the NRC, that would make it 10 millirem or
11 .1 millisieverts which is much lower than I said the
12 Canadian legal limit is.

13 Q. So the editor may have been making an
14 editorial comment there?

15 A. Well, yes. There has been some
16 discussion over the last year or so with the AECB about
17 how their standards compare with those in other
18 countries.

19 Q. But certainly the --

20 A. The situation in the States is
21 complicated because a number of different groups
22 regulate emissions, but...

23 Q. But certainly the first sentence, as
24 it relates to the NCI study--

25 A. Yes.

1 Q. --is correct?

2 A. Yes.

3 The study also examined cancer
4 incidence as distinct from cancer
5 mortality in counties near four nuclear
6 facilities in Iowa and Connecticut
7 where such data were available from
8 existing cancer registries. NCI said the
9 results resembled mortality data patterns
10 in those counties and provided no
11 evidence that the presence of nuclear
12 facilities had any influence on cancer
13 rates. Data on cancer incidence does not
14 exist on a nation-wide basis.

15 Q. And again, can you confirm that
16 that's your understanding of Jablon's findings?

17 A. Yes, that's my understanding.

18 [3:32 p.m.]

19 Q. And the last paragraph mentions a
20 study by Columbia University which showed no increase
21 in cancer incidence as a consequence of the 1979 Three
22 Mile Island accident. Are you familiar with that
23 study?

24 A. I believe they are referring to a
25 study by Hatch and coauthors in 1991, I believe.

1 Q. And their comment there is correct,
2 is it not, about their findings?

3 A. That's my understanding, yes.

4 Q. Thank you. That's all, Dr. Whillans,
5 I think for the time being, and thank you.

6 Do you wish to take a break now, Mr.
7 Chairman, or would you like me to continue on?

8 THE CHAIRMAN: All right. We will take a
9 15-minute break.

10 THE REGISTRAR: Please come to order.
11 This hearing will recess for 15 minutes.

12 ---Recess at 3:34 p.m.

13 ---On resuming at 3:52 p.m.

14 THE REGISTRAR: Please come to order.
15 This hearing is again in session. Be seated, please.

16 DR. WHILLANS: Excuse me, Mr. Chairman.
17 May I add something to the comments that I just made?

18 In checking over the break there were a
19 couple of things about the summary in Exhibit 573 that
20 I would like to add to.

21 MR. BULLOCK: Q. 573?

22 DR. WHILLANS: A. Is that not the
23 correct number for your...

24 Q. For the CCH?

25 A. CCH.

1 Q. 575, I believe.

2 A. I'm sorry.

3 THE CHAIRMAN: 573 is the calculations?

4 DR. WHILLANS: Sorry? Not the
5 calculations, no.

6 The first comment was I would just like
7 to put on the record that the study by Jablon that we
8 were talking about in the NCI is published among other
9 places in the Journal of the American Medical
10 Association, Volume 265, page 1403, March, 1991. And
11 on checking the conclusions that are summarized here I
12 agree are correct.

13 I also looked at the question about the
14 dose that would be permitted by the Nuclear Regulatory
15 Commission, and I am still very unclear about that.
16 They are referring to a dose of 1,000 times less than
17 10 rem or 10 millirem or a tenth of a millisievert, and
18 I don't know of any regulation of that kind.

19 The EPA in the U.S. regulates some
20 facilities to 25 millirem, which would be a 40th, not a
21 thousandth. So I am not clear about what they mean
22 there.

23 And finally, the last paragraph referred
24 to the NCI study coming on the heels of a separate
25 study by researchers at Columbia, and I agreed that I

1 thought that was a correct interpretation.

2 However, I now find that the paper which
3 describes cancer rates after the TMI accident by Hatch
4 from Columbia was published in June, '91, and this came
5 out in May, '91, so I guess I have to say I don't know
6 what paper they are referring to, unless they had an
7 earlier draft.

8 MR. BULLOCK: Q. Which they may have?

9 DR. WHILLANS: A. Which they may have.

10 Q. Just so we are clear then, Dr.
11 Whillans, you do not agree with the second sentence in
12 the first paragraph on page 3594 of the article? You
13 believe that to be incorrect; is that right?

14 A. Well, I certainly agree with the
15 first part of the sentence.

16 Q. Right. You agree with the first
17 sentence. The second sentence is the one about the --

18 A. No. But I agree that no adverse
19 health effects have been demonstrated from exposures
20 below 10 rem.

21 Q. Right.

22 A. But the comparison with the NRC
23 publicly dose limit is something--

24 Q. May be an editorial comment?

25 A. --I just don't know about.

1 Q. Very good. Thank you for those.

2 Mr. Chairman, just again on the
3 calculation side of things, Mr. King was kind enough to
4 provide the 1986 StatsCan cancer death rate per hundred
5 thousand population, and I understand it to be 187.5,
6 and that's for a mixed population.

7 Isn't that right, Mr. King? Sorry?

8 MR. KING: A. Yes.

9 Q. And when we work that out for a
10 population for the Greater Pickering Area of 3 million
11 we come out with expected cancer deaths in any
12 particular year of 5,625; is that correct?

13 A. I'll take your calculation. Sounds
14 about right.

15 Q. Thank you. Mr. Johansen, I wanted to
16 move on to a few questions about used fuel and low and
17 medium level radioactive waste, if I could.

18 I would like to start by taking you to
19 Exhibit 519, page 54, and I am hoping very much, Mr.
20 Chairman, to be done today. I think if we roll along
21 we should be able to achieve that.

22 MR. JOHANSEN: A. Yes, I have got that.

23 Q. And that is the transportation cask
24 for used fuel; correct?

25 A. That's correct.

1 Q. And I understand that such a cask
2 would hold 192 used fuel bundles; is that right?

3 A. That's correct.

4 Q. And how many used fuel bundles would
5 be produced by a 4 by 881 station in a typical week,
6 Mr. Johansen. Would that be about 420 or so?

7 A. That would be roughly correct. If
8 you were to refer back to page 52 of Exhibit 519, which
9 was my table summarizing the quantities of used fuel
10 from each existing plant to the end of 1990 and
11 projecting into the future--

12 Q. Right?

13 A. --if you take the quantity for
14 Darlington, for example, and assume roughly 20
15 kilograms per bundle and work out a weekly rate on the
16 basis of the figures shown here, 19,000 megagrams or
17 metric tons over 40 years, then that calculates to
18 about 450 bundles per week. So you are roughly
19 correct.

20 Q. That's fine. When we talk, then,
21 about transportation of the used fuel bundles to a fuel
22 disposal facility that is mentioned in Exhibit 519 as
23 well, when and if that is established, we are talking
24 approximately two or three shipments a week; is that
25 right?

1 A. Something like that, yes.

2 Q. And how would those be shipped, just
3 by truck; is that right?

4 A. Well, that has yet to be determined.

5 As I also indicated in my direct evidence we are
6 keeping the options wide open so far, and the
7 possibilities include road, rail, water or some
8 combination of those. So it hasn't yet been determined
9 what the mode will be.

10 Q. But the point is we are not talking
11 about perhaps several daily shipments or anything like
12 that in a typical week.

13 A. That's right.

14 Q. Is that not right?

15 A. That's right.

16 Q. So when we are talking about impacts
17 that might be an important consideration, would it not?

18 A. Yes, certainly.

19 Q. And when we are looking at the used
20 fuel storage and used fuel disposal then for a minute,
21 if I could take you, please, to Volume 122 of the
22 transcript, page 21,335? Volume 122, page 21,335.

23 A. Yes, I've got it.

24 Q. Starting at line 4?

25 A. Yes?

1 Q. I just want to make sure I have the
2 process for handling the used fuel correct. So using
3 that line 4 as a jumping off point I understand that
4 the fuel initially goes to a pool, is that right, a wet
5 storage?

6 A. Yes. A pool right in the plant,
7 that's right.

8 Q. In that paragraph it talks about:
9 After about six years the fuel is cooled sufficiently
10 that it can be transferred to some other facility on
11 site for storage in the longer term.

12 I take it by "cooled" you mean not just
13 the question of temperature but the question of having
14 a lower radioactive level of activity; is that right?

15 A. Yes. Both.

16 Q. All right. And after six years then
17 it goes to, I believe you said, auxiliary on-site
18 storage. Is that the right term?

19 A. Yes. And I might just add, Mr.
20 Bullock, that that six-year period is sort of a
21 threshold period. If the primary bay has the capacity
22 to accommodate the fuel, the fuel could indeed stay in
23 that primary bay for a longer period.

24 Q. And that would be perfectly safe?

25 A. Yes.

1 Q. All right. And you mentioned that
2 most of the auxiliary storage to date had been wet
3 storage, so again the pool method; is that right?

4 A. Yes.

5 Q. Now, at page 21,336 at the top of
6 that page -- and I notice through your evidence you
7 were very careful to always say it could be safely
8 stored in these pools using a wet storage method for at
9 least 50 years; is that right?

10 A. Yes.

11 Q. So I took from that that it could be
12 safely stored for a longer period of time; is that
13 right?

14 A. Possibly.

15 Q. And presuming that proper maintenance
16 and everything is carried out, then it could be safely
17 stored in that way for virtually an indefinite period
18 of time, could it not?

19 A. Conceivably, we could continue to
20 repackage the fuel in an endless sequence, and, yes, it
21 would be possible to perpetually store the fuel.

22 Q. All right.

23 A. But we don't have that planned safely
24 yet.

25 Q. Safely. Then when you were talking

1 about the dry auxiliary storage method that had been
2 developed, and I believe the container for that is
3 shown at page 53 of Exhibit 519; is that correct?

4 A. That is correct.

5 Q. And I understood your evidence in
6 chief to be that the dry storage method is now being
7 used at Douglas Point and Point Lepreau in New
8 Brunswick; is that correct?

9 A. That is correct.

10 Q. And there haven't been any
11 difficulties with it there?

12 A. None.

13 Q. And the used fuel has been stored
14 perfectly safely in those containers at those
15 locations; is that correct?

16 A. That's correct.

17 Q. And again if I could take to you
18 Volume 122 again, page 21,340--

19 A. Yes?

20 Q. --at the top of that page, again you
21 were very careful to point out that the used fuel could
22 be stored safely for at least 100 years using the dry
23 storage method?

24 A. Yes, that is the assessment.

25 Q. And I take it that again it could be

1 stored safely for an indefinite period presuming
2 appropriate maintenance of the containers; is that
3 fair?

4 A. Yes. As I said before, through the
5 sequence of repackaging it could be endless. Again, I
6 should add that that is not our plan.

7 Q. I understood that to be your
8 evidence.

9 A. But it is possible.

10 Q. But technically there are no
11 technical limitations to storing it safely for an
12 indefinite period?

13 A. That's correct.

14 Q. May I ask you, Mr. Johansen, if
15 Ontario Hydro has studied the costs of shall we call it
16 extended on-site storage versus the costs of the
17 disposal concept that we find described in Exhibit 519?
18 Has that kind of comparative study been done?

19 A. Extended in the sense of some
20 reasonable extension beyond the time frame--

21 Q. That's correct.

22 A. --which we have in our used fuel
23 plant. Yes, we have looked at that as a contingency.
24 Obviously, there are a lot of factors that might tend
25 to make it difficult to achieve that 2025 date. It is

1 not something that is within our control, so it is in
2 our view responsible to have a contingency plan, should
3 that indeed occur.

4 Q. Right. And that contingency plan
5 would be to have the materials stored on site for an
6 extended period of time; correct?

7 A. Yes.

8 Q. And that could be done perfectly
9 safely; correct?

10 A. Yes.

11 Q. Can I talk for a moment, Mr.
12 Johansen, about the low and medium level radioactive
13 waste--

14 A. Okay.

15 Q. --that you mentioned in your evidence
16 in chief? So that is non-fuel radioactive waste; is
17 that correct?

18 A. That's correct.

19 Q. And you mentioned -- or perhaps the
20 question to you would be: Could the Bruce waste
21 facility that you mentioned accommodate the low and
22 medium level radioactive waste from an additional CANDU
23 "A" 4 by 881 generating station? Could that be
24 accommodated at Bruce?

25 A. The site could. The existing

1 facilities would have to be expanded, but the total
2 facility plus the unused property at the Bruce Nuclear
3 Power Development site would be adequate to accommodate
4 storage requirements until...I think in my direct
5 evidence I said the year 2015, but it could be beyond
6 that even.

7 Q. So it could be extended beyond that
8 period if you were to extend the existing waste
9 facility -- I guess they were silos or something that
10 you mentioned, were they?

11 A. Well, there is a variety that
12 accommodate different types of waste. There would be
13 extensions in the concrete trenches and in-ground tile
14 holes and--

15 Q. Subject of course--

16 A. --and so on.

17 Q. --to the environmental assessment
18 process or whatever other process we are left with when
19 Mr. Sewell is finished with his review.

20 A. That's right.

21 Q. I take it, then, that there is no
22 technical difficulties with extending or expanding that
23 facility; is there? We have the technology to do that;
24 correct?

25 A. No. No.

1 Q. We do have the technology --

2 A. We do have the technology, that's
3 right.

4 Q. And if I could just deal for the next
5 few minutes, Mr. Johansen, with the expected
6 environmental impacts of an additional CANDU "A" 4 by
7 881 station, the cumulative environmental impacts, the
8 natural environmental impacts?

9 You mentioned in your evidence in chief
10 about, with the exception of the radioactive emissions,
11 with respect to non-radioactive air emissions there are
12 virtually none from another nuclear generating station?

13 A. That's correct.

14 Q. So if we were to talk then about the
15 cumulative impact of a new CANDU "A" 4 by 881 station
16 essentially there would be no impact with respect to
17 non-radioactive air emissions; is that correct?

18 A. That's right.

19 Q. Can we talk for a moment about
20 cooling water, and if I could take you to Volume 122,
21 page 21325 and over to 21326, Volume 122, page 21325
22 commencing at line 23, you were summing up your
23 evidence about cooling water, and your evidence was
24 that:

25 Based on the results of years of

1 study and the once-through cooling
2 improvement program which was initiated
3 in the mid-1970s and carried through to
4 the early 80s, plus the results of
5 site-specific environmental studies, it
6 is our conclusion that lake-wide adverse
7 effects are insignificant and local
8 effects are minor.

9 That was your evidence; correct?

10 A. Yes, that's correct.

11 Q. And with the addition of another
12 CANDU "A" 4 by 881 station you wouldn't expect that
13 conclusion to change, would you?

14 A. I wouldn't in general, but these
15 things tend to be quite site-specific, cooling water
16 impacts, and the sort of--

17 Q. Well, that would be with respect to
18 local effects.

19 A. --design. Yes, local effects. The
20 lake-wide effects I wouldn't expect to change, no.
21 That's right.

22 Q. So with respect to lake-wide adverse
23 effects they would continue to be insignificant even
24 with the addition of a CANDU "A" 4 by 881; is that
25 correct?

1 A. That would be my expectation, yes.

2 Q. With respect to the local effects you
3 have no reason to believe that they would be other than
4 minor, do you?

5 A. No, I don't have any expectations
6 that they would be other than minor, that's right.

7 We have the technology, which I talked
8 about in connection with Darlington, and I believe that
9 that sort of technology can be adapted to virtually any
10 site-specific condition that I can imagine on the Great
11 Lakes such that the effects would remain minor.

12 Q. And you can turn it up if you would
13 like, Exhibit 507, page 4-6 talks about some of these
14 site-specific studies and essentially with respect to
15 Pickering and Bruce and Darlington concluded that the
16 local impacts of the cooling water were--

17 A. Yes.

18 Q. --minimal?

19 A. Yes.

20 Q. Thank you.. If we can just talk for a
21 minute about waste water then, Mr. Johansen? You had
22 mentioned the fact that with the existing stations the
23 waste water emissions are handled as part of the
24 certificate of approval process with MOE; is that
25 right?

1 A. Yes, that's right.

2 Q. And you have no reason to expect that
3 similar emissions couldn't be handled by that process
4 with a new CANDU "A" station, would you? You would
5 expect the same kind of certificate of approval process
6 to apply?

7 A. Yes, that's right. The MISA program
8 will probably be in place, or that is, a regulation, a
9 limits regulation, will probably be in place by that
10 time.

11 Q. Right. And could you just remind us
12 what the acronym stands for?

13 A. It's the Ontario or the provincial
14 program or strategy for abatement of -- it stands for
15 Municipal Industrial Strategy for Abatement of liquid
16 effluents, essentially.

17 Q. Right. And so if those regulations
18 come into place then we could actually be looking at a
19 situation where waste water emissions from a new CANDU
20 "A" station could in fact be cleaner than existing
21 stations; is that right?

22 A. Well, I would say that a combination
23 of two things will likely mean that future emissions
24 will be lower than they are now. One is the MISA
25 regulatory program and the other is simply our

1 continual efforts to reduce emissions when technology
2 becomes available and is practical.

3 Q. By appropriate environmental
4 management?

5 A. Yes.

6 Q. All right. And just while we are on
7 the MISA topic, do you have any sense of which will be
8 more costly, MISA as it applies to nuclear facilities
9 or MISA as it applies to fossil stations? Do you have
10 any sense of which will be more costly?

11 A. That is pretty speculative. We
12 really haven't--

13 Q. Looked at that?

14 A. --looked at that. Well, we are
15 looking at it, but we haven't come to a conclusion. I
16 mean, I would just--

17 Q. You are not in a position to answer
18 that?

19 A. --provide a very rough guess, and I
20 don't think it could be very helpful.

21 Q. So you are not in a position to
22 answer that?

23 A. Not really.

24 [4:12 p.m.]

25 Q. Any other members of the panel, Mr.

1 King, Mr. Daly, not in a position to answer it?

2 All right. A couple of questions about
3 potential sites, candidate sites, Mr. Johansen, for
4 future nuclear facilities.

5 If I could take you, please, to page
6 14-37 of Exhibit 3, please.

7 A. What was that page number again?

8 Q. 14-37.

9 A. 37.

10 Q. Of Exhibit 3.

11 A. All right, I have got it.

12 Q. Do you have it. Do you have it, sir?

13 A. Yes.

14 Q. All right. And we see on that
15 page -- do you have it, Mr. Chairman?

16 THE CHAIRMAN: Yes.

17 MR. BULLOCK: Q. Figure 14-22. Do you
18 have that, Mr. Johansen?

19 MR. JOHANSEN: A. Yes, I do.

20 Q. Just to the left of that figure we
21 see a column entitled: Candidate Sites for Nuclear
22 Option.

23 A. Yes.

24 Q. And we see the following sites can
25 accommodate a 4 by 881 megawatt CANDU station. And I

1 understand there are four such sites; is that right;
2 Darlington "B", Bruce "C", Wesleyville "A" and "B"?

3 A. Those are the ones that are listed
4 here. I believe in the end those got pruned.

5 Q. To...?

6 A. The Bruce "C" site I think in the end
7 was not recommended as a candidate site for nuclear.

8 Q. I'm sorry, I don't understand. My
9 question to you is--

10 A. Certainly it's listed here.

11 Q. --what sites are available that can
12 accommodate a new 4 by 881 CANDU "A" station, that's my
13 question.

14 A. They are the ones that are listed
15 here, Darlington "B", Wesleyville "A" and "B", Bruce
16 "C" and the North Channel which we don't currently own
17 of course.

18 Q. Right, of course.

19 Can you just confirm for me the factual
20 information on page 14-37 remains current. So, in
21 other words, under Darlington "B", one existing CANDU
22 station on site, no additional site acquisition
23 required, near load growth area.

24 Could you just scan those for the
25 candidate sites on that page and confirm for me that

1 that information is still current and that the
2 information on figure 14-22 is still current?

3 THE CHAIRMAN: Do you mean the
4 information on figure 14-22 relating to nuclear sites
5 is that what you are saying?

6 MR. BULLOCK: Correct, sir.

7 MR. JOHANSEN: There may be others on the
8 panel who would have an opinion to add to mine, but the
9 Darlington "B" description looks up to date.

10 MR. BULLOCK: Q. I just wanted to make
11 sure there haven't been any changes of which we are not
12 aware.

13 MR. JOHANSEN: A. The Wesleyville "A"
14 site, the indication there is that there is no existing
15 station on the site. I guess it's true that there is
16 no operating station on site, but we did start to build
17 an oil-fired plant there and there are remnants.

18 Q. Sort of foundations?

19 A. And a stack still there.

20 Q. Right.

21 A. That would have to be dealt with.

22 Q. Right. You don't anticipate any
23 problems, environmental problems dismantling that; do
24 you?

25 A. No, I wouldn't. So it's again the

1 description for Wesleyville "A" and "B"--

2 Q. Right.

3 A. --looks up to date.

4 Q. Right.

5 A. Bruce "C", yes, there are two
6 existing stations and other facilities on the site
7 obviously.

8 Q. Right.

9 A. The last bullet, I guess is what was
10 in my mind when I said that Bruce "C" either hadn't
11 been included in the final listing or had some
12 constraints against it and, as it says here, the
13 generation concentration which would result if an
14 additional plant were built on the site would exceed
15 the criterion of limited generation at one site.

16 Q. Right.

17 A. And, therefore, as it indicates here,
18 this site can only be used towards the end of the
19 25-year planning period.

20 Q. Right. So that was a constraint?

21 A. I believe that to be true subject
22 to --

23 Q. So that was a constraint that existed
24 when Exhibit 3 was prepared and continues to exist; is
25 that right?

1 A. I believe so, yes.

2 Q. Okay.

3 A. And the North Channel site, it's not
4 owned, that's true. Several potential sites in the
5 area were investigated in the late 70s and that's true.

6 Physically can accommodate two stations.
7 I believe that's generally true, although that's based
8 only on desk-top studies and some limited field studies
9 which were curtailed when the moratorium was announced.

10 Q. Right. So generally then with the
11 qualifications that you have given, generally the
12 factual information on that page and in figure 14-22 as
13 it respects potential nuclear sites, candidate sites is
14 correct?

15 A. Yes, I believe it is.

16 Q. All right. And can I just take you,
17 please, to page 14-35, just back a page, under the
18 heading Sighting Considerations, it starts in the
19 middle column there.

20 A. Yes, I see it.

21 Q. And it runs over, Mr. Johansen, to
22 page 14-36. So it's two columns on page 14-35 and one
23 column on page 14-36.

24 Could I just have you confirm for me that
25 those, I guess it's the technical and economic criteria

1 mentioned in that section, do those criteria continue
2 to be accurate, for instance, the information about
3 geographic balance between generation and load, limited
4 generation at one site, physical requirements, things
5 of that nature, I just want to make sure again that the
6 information at pages 14-35 and 14-36 is current.

7 Is that so or, Mr. Penn, perhaps can you assist us?

8 A. Well, I was just going to suggest
9 that Mr. Penn perhaps is a better person to answer
10 this.

11 Q. Certainly.

12 MR. PENN: A. That is if you will give
13 me a moment to reread them.

14 Q. Certainly.

15 A. Well, the question of geographical
16 balance between generation and load is just good system
17 planning and there is no reason to say that is
18 outdated.

19 Highly desirable that we don't have very
20 large concentrations of generation at one site, so that
21 still holds.

22 Q. Right.

23 A. I would agree with the requirements
24 of specific sites for specific options.

25 A. Clearly we must have reliable

1 transmission in corporation which means joining the
2 generating station to the bulk electric system.

3 Do you want me to keep going on right to
4 the end of--

5 Q. I would just like you to confirm
6 there are no changes, Mr. Penn.

7 A. --of the column?

8 Q. Please.

9 A. Well, the policy on effective land
10 use is one that Hydro has followed for as long as I can
11 remember, many, many years, no need to make any change
12 there at this time.

13 The question of lead time is certainly
14 site-specific.

15 Well, I guess with cost I am not sure
16 whether the word general economic implications applies
17 to socio-economic implications, but obviously that is
18 part of it.

19 MR. JOHANSEN: A. I might just add that
20 these criteria that we have been looking at are only
21 technical and economic criteria in that in the end of
22 course of any comprehensive sighting program we have to
23 include criteria that go far beyond these.

24 Q. Quite so. They would have to go
25 through the environmental assessment process

1 essentially?

2 A. Yes.

3 Q. Presumably this hearing will assist
4 in the consideration of site-specific hearings
5 applications, but certainly they would have to comply
6 with other criteria.

7 And perhaps one question, Mr. Penn, with
8 respect to cost. It's cheaper; is it not, to develop
9 an existing site as opposed to a new site. That's
10 obvious; isn't it?

11 MR. PENN: A. Yes. It's only one of the
12 criteria though, of course.

13 Q. Quite so. And, Mr. Johansen, when we
14 are talking about natural environmental impacts then,
15 would you agree with me that developing a new CANDU "A"
16 station on an existing site, it would have quantitative
17 environmental impacts, would you agree that the
18 qualitative environmental impacts would be minimal?

19 MR. JOHANSEN: A. You would have to
20 define qualitative versus quantitative for me before I
21 could agree with that.

22 Q. Well, for instance, let's take air
23 emissions. While there may be some -- perhaps air
24 emissions is not such a good example.

25 Cooling water. While there may be some

1 additional quantitative local impacts, for instance,
2 the cooling water coming out of your diffuser system
3 may increase the temperature of the local water
4 slightly, qualitatively presuming appropriate
5 mitigative measures are taken - and you have mentioned
6 those as part of your environmental management
7 program - presuming those are taken, you are not going
8 to see any erosion of the natural environment
9 characteristics in the area; are you?

10 THE CHAIRMAN: That's a very, very broad
11 question. I don't know whether --

12 MR. BULLOCK: Q. Can you answer it, Mr.
13 Johansen, would it have to be determined on a --

14 THE CHAIRMAN: I'm not sure what you are
15 asking him. I don't quite understand what you are
16 asking him.

17 MR. BULLOCK: What I am suggesting, Mr.
18 Chairman, is that with respect to the environmental
19 criteria that I have explored with Mr. Johansen, air
20 emissions, cooling water, waste water, for instance,
21 while --

22 THE CHAIRMAN: You are talking now about
23 matters relating to nuclear generation; is that
24 correct?

25 MR. BULLOCK: Yes, sir. I'm talking

1 about the construction of a new CANDU "A" station on an
2 existing site, and I am suggesting that while with
3 respect to the environmental criteria that I have
4 mentioned there may be quantitative increases, when you
5 then talk about environmental impacts, those are going
6 to be minimal.

7 THE CHAIRMAN: Well --

8 MR. BULLOCK: And it may be too broad a
9 question to put to Mr. Johansen.

10 THE CHAIRMAN: I think it's too broad to
11 answer because you can't compartmentalize matters like
12 that, I don't think.

13 MR. BULLOCK: Fair enough, sir.

14 Q. Mr. Johansen, could I move on,
15 please, to the question of CO(2) emissions. I have
16 just a couple of questions.

17 THE CHAIRMAN: I am not stopping you from
18 asking questions like that, I am just saying I think
19 you have to be more specific. I think it's very
20 difficult to answer a question in general terms of that
21 nature.

22 MR. BULLOCK: I appreciate it, Mr.
23 Chairman, and I think that we have evidence on the
24 record about the cumulative impacts, for instance, on
25 the lake wide effects of cooling water and the local

1 effects of cooling water and I'm content with those
2 answers. I was just trying have Mr. Johansen compare.

3 Q. Perhaps I could put the question this
4 way, Mr. Johansen: Would it be fair to say that the
5 environmental impact would be less if a new CANDU "A"
6 station was constructed on an existing site then if it
7 were constructed on a new site?

8 Perhaps that's a better way of putting
9 the question, Mr. Chairman.

10 MR. JOHANSEN: A. Well, the incremental
11 impact of building a new plant on an existing site
12 might be less if it were on an existing site as opposed
13 to a new site, but I don't think you could generalize
14 across the whole spectrum of environmental impact
15 factors that need to be addressed, it's too
16 site-specific.

17 Q. I am just talking natural.

18 A. Yes.

19 Q. Natural environment.

20 A. Even so, that includes a lot of
21 things.

22 Q. Very well. Could we move on to CO(2)
23 emissions then, please, and you are aware, Mr.
24 Johansen, that the federal environment ministers
25 recently met in Vancouver to discuss issues such as

1 atmospheric emissions, CO(2), global warming; are you
2 not?

3 A. I'm generally aware of that, yes,
4 they do that every year.

5 Q. All right. And do you have a copy,
6 Mr. Johansen, of the CCME Communique dated March 19th,
7 1992; do you have that in your materials?

8 A. I believe you gave us that some time
9 ago. I have forgotten exactly where it was.

10 MR. BULLOCK: Mr. Lucas, perhaps we could
11 have that as the next exhibit, Mr. Chairman.

12 THE REGISTRAR: 576.

13 MR. JOHANSEN: Right, I have got it.

14 ---EXHIBIT NO. 576: CCME Communique dated March 19th,
15 1992.

16 MR. BULLOCK: And, Mr. Chairman, I do
17 have the original that I received from the CCME offices
18 and perhaps I can file that original with Mr. Lucas.

19 Exhibit number, Mr. Lucas, please?

20 THE REGISTRAR: 576.

21 MR. BULLOCK: And for the record, Mr.
22 Chairman, it's a communique from the Canadian Council
23 of Ministers -- sorry, Canadian Council of Ministers of
24 the Environment, CCME, it's dated March 19th, 1992, and
25 it was issued, sir, after their recent meeting in

1 Vancouver, British Columbia.

2 Q. Perhaps, Mr. Johansen, I could take
3 you to page 2, under the heading atmospheric issues.

4 MR. JOHANSEN: A. Yes.

5 Q. You are familiar with the CCME I take
6 it?

7 A. Yes, I am.

8 Q. You are familiar with the fact that
9 they recently met in Vancouver; are you not?

10 A. Yes.

11 Q. And if I could take you then to the
12 atmospheric issues, first bullet:

13 Canada is committed to stabilizing
14 emissions of CO(2) and other greenhouse
15 gases not controlled by the Montreal
16 protocol at the 1990 level by the year
17 2000. This is a national goal and does
18 not directly pertain to specific regions
19 or sectors. Ministers stated that
20 domestic action should not await the
21 signature of an international convention
22 on protocols. They agreed to continue to
23 work closely with energy ministers in
24 elaborating the national actions strategy
25 to address global warming.

1 Is it fair to say that global warming
2 continues to be an important environmental issue today?

3 A. Oh, most certainly, and I think that
4 is the right word, issue.

5 Q. All right. And to take you to the
6 bottom of that page, page 2:

7 A number of initiatives are
8 already in place or planned. The
9 Ministers agreed to work with energy
10 ministers to assess the extent to which
11 these actions will contribute to the
12 national goal and what additional actions
13 will be needed. This assessment will be
14 reviewed at the fall CCME meeting as
15 atmospheric issues continue to be a key
16 item on the Ministers agenda.

17 And the next bullet, starting on page 3:

18 The Ministers reconfirmed their
19 desire to sign a comprehensive national
20 air quality management agreement which
21 would encourage federal, provincial and
22 territorial governments to deal with air
23 quality issues in an integrated and
24 coordinated manner. This multi-lateral
25 agreement would serve as an umbrella for

1 specific federal/provincial initiatives
2 dealing with issues such as smog, sulfur
3 dioxide and global warming. The
4 comprehensive agreement will be drafted
5 in close consultation with appropriate
6 ministries.

7 Were you aware of those initiatives or
8 are you aware of those kinds of initiatives going on
9 through the auspices of CCME, Mr. Johansen?

10 A. Yes, I am. I had some knowledge of
11 these initiatives being under development for some
12 time.

13 Q. And certainly it continues to be on
14 the CCME agenda; is that not, global warming?

15 A. Yes.

16 Q. I understand that Ontario Hydro had a
17 task force study the issue of global warming in
18 1988-89; is that correct?

19 A. That's correct. And Dr. Effer I
20 believe testified at some length about that during
21 Panel 8.

22 Q. Right. And I just wanted to touch on
23 it briefly, and I have provided you with a copy, an
24 excerpt from Exhibit 21, the 1989 State of the
25 Environment Report, page 15. Do you have that?

1 A. Yes, I do.

2 MR. BULLOCK: Mr. Lucas? And I don't
3 know as it needs to be separately marked, Mr. Chairman,
4 it is already an exhibit.

5 THE CHAIRMAN: It's just a page from it?

6 MR. BULLOCK: It is, sir.

7 THE CHAIRMAN: All right. It doesn't
8 need to be marked.

9 MR. BULLOCK: Q. So, Mr. Johansen,
10 looking at the page 15 excerpt from Exhibit 21, the
11 conclusions of that task force are summarized under the
12 bullet global warming; is that right?

13 MR. JOHANSEN: A. Yes. I think these
14 are somewhat paraphrased but, as I recall the actual
15 task force report itself, this is roughly what they
16 concluded.

17 Q. And the task force concluded that

18 Ontario Hydro could meet a 20 per
19 cent reduction in CO(2) emissions by 2005
20 if load growth follows the median path,
21 if economic quantities of demand
22 management, non-utility, and
23 hydroelectric generation are implemented,
24 and if further nuclear generation is
25 constructed.

1 And the second bullet:

2 If all sectors of the Ontario
3 economy are required to reduce CO(2)
4 emissions, this is likely to be done
5 through the implementation of energy
6 efficiency improvement programs and by
7 shifting to lower carbon fuels. The
8 latter could lead to increased electrical
9 demand which could exceed Ontario Hydro's
10 ability to supply non-fossil generation.

11 Those were the conclusions of the task
12 force; is that correct?

13 A. As I recall it, yes.

14 Q. And, Mr. Johansen, if I could just
15 take you now then to another point about CO(2)
16 emissions technologies, that is found at page 14-17 of
17 Exhibit 3. Could we flip to that, page 14-17 of
18 Exhibit 3.

19 [4:33 p.m.]

20 A. I have got it.

21 Q. You have got it? Second column,
22 first paragraph:

23 The level of carbon dioxide emissions
24 for each fossil option is a long-term
25 concern. CO(2) is considered a major

1 contributor to global warming, and there
2 is no existing cost effective technology
3 which will reduce CO(2) emissions for any
4 fossil option. Electrical efficiency
5 improvements along with non-fossil supply
6 options are preferable alternatives for
7 CO(2) control.

8 Does that paragraph remain true today?

9 A. Yes. I might just add that where it
10 says 'CO(2) is considered a major contributor to global
11 warming', if I had worded this I wouldn't have put it
12 quite that way.

13 In my view, what the corporate assessment
14 is that CO(2) is considered to be a major potential
15 contributor. In other words, it really hasn't been
16 established that there is a cause/effect relationship
17 between CO(2) and global warming.

18 Q. I understand that that may be the
19 present corporate position, but from your review --

20 THE CHAIRMAN: No, no. I didn't take him
21 to mean it was the corporate position.

22 MR. BULLOCK: I thought that is what he
23 said. Isn't that right?

24 THE CHAIRMAN: I thought he was speaking
25 generally of the issue in the world about this --

1 MR. BULLOCK: I don't think so.

2 Q. You were speaking of Ontario Hydro's
3 perspective, were you not, Mr. Johansen?

4 MR. JOHANSEN: A. I am basically echoing
5 what I believe Dr. Effer testified to during Panel 8.

6 Q. Right. So you were speaking of
7 Ontario Hydro as a legal entity?

8 A. Yes.

9 Q. Its position.

10 A. It is our view it hasn't been
11 established, but it is also our view that it is
12 important enough an issue that it is prudent for us to
13 assume that there is some potential there and that we
14 should--

15 Q. And I wanted to know what --

16 A. --take reasonable steps to minimize
17 the potential --

18 Q. And I want to know what your view as
19 an expert in the environmental area was, and would that
20 be that CO(2) emissions continue to be a long-term
21 concern for fossil option; is that fair?

22 A. Yes, that's a fair statement.

23 Q. And would it be fair to say that from
24 your review of the literature and the studies and
25 materials such as the CCME information and the task

1 force report that it is fair to say that CO(2) is
2 considered to be a contributor to global warming? You
3 are not suggesting that it isn't a contributor to
4 global warming, are you?

5 A. I am saying that CO(2) is
6 obviously -- that CO(2) emissions from fossil
7 generation obviously contribute to the buildup of
8 atmospheric CO(2) and the debate is ongoing as to
9 whether that gradual rise in CO(2) is in fact connected
10 with the Greenhouse Effect.

11 Now, I think you are asking me to restate
12 my earlier view, and I am basically saying that it is
13 prudent for us to assume that there is some connection
14 and to take reasonable precautionary measures, but at
15 the same time we don't believe that the cause/effect
16 relationship has been established beyond reasonable
17 doubt.

18 Q. It is a pretty tough standard, isn't
19 it.

20 Perhaps just then the question of -- I
21 take it you agree with the statement, then, that there
22 is no existing cost effective technology which will
23 reduce CO(2) emissions for any fossil options? You
24 certainly agree with that as a factual statement?

25 MR. B. CAMPBELL: Mr. Chairman, at some

1 point this wandering back into Panel 8 should perhaps
2 stop. Is this perhaps a good point?

3 THE CHAIRMAN: I didn't quite understand
4 the last question. What was the last question you
5 asked?

6 MR. BULLOCK: Looking at paragraph 1,
7 second column, page 1417, I just want to ensure -- I
8 had thought Mr. Johansen's evidence was that the
9 paragraph was correct with perhaps a qualifier about
10 the major contractor.

11 I then understood that that might not be
12 the case, and I am just asking him now, the question
13 is, does he agree with the statement: There is no
14 existing cost effective technology which will reduce
15 CO(2) emissions from any fossil option; is that not a
16 true statement?

17 THE CHAIRMAN: Well, that is a Panel 8
18 question, isn't it now, Mr. Bullock?

19 MR. BULLOCK: No.

20 THE CHAIRMAN: I think that matter was
21 dealt with in Panel 8.

22 MR. BULLOCK: It may well be, sir, but he
23 had given evidence earlier about the issue and I would
24 simply like him to clarify that and I am happy to move
25 on.

1 THE CHAIRMAN: I think if you read the
2 transcript of Panel 8 you will find that that issue was
3 dealt with.

4 MR. BULLOCK: No, sir, but I am dealing
5 with Mr. Johansen's evidence.

6 THE CHAIRMAN: I understand that, but I
7 think it is better that you read Panel 8 evidence on
8 that stand.

9 MR. BULLOCK: Q. Perhaps, Mr. Johansen,
10 I could take you, please, to tab 26 of the
11 interrogatories brief?

12 MR. JOHANSEN: A. Yes.

13 Q. Tab 26, Interrogatory 9.44.26.

14 THE REGISTRAR: That becomes .52.

15 ---EXHIBIT NO. 520.52: Interrogatory No. 9.44.26.

16 MR. BULLOCK: Q. And we will see that at
17 the top of that interrogatory it is headed "Witness
18 Panel, Nuclear Options", and the question, the
19 interrogatory question was about anticipated regulatory
20 amendments--

21 MR. JOHANSEN: A. Yes.

22 Q. --for air emissions; is that right?

23 A. Yes.

24 Q. And I see that the response details
25 various areas. It summarizes the major current

1 statutory limits, and then it goes on in the third
2 paragraph:

3 Ontario Hydro anticipates the
4 following future regulatory changes.
5 Then there are two bullets, one dealing with NOx and
6 one dealing with a new provincial air pollution control
7 regulation requiring an integrated approach, and there
8 is no mention of CO(2) reductions.

9 Should that be in there or is Ontario
10 Hydro not anticipating CO(2) regulations,
11 notwithstanding the CCME work?

12 A. Well, I think what is being listed
13 here are regulatory changes.

14 Q. Anticipated regulatory changes?

15 A. That's right.

16 Q. My question to you is --

17 A. And I assume that CO(2) is not
18 mentioned here because it is not yet -- it does not yet
19 have that status.

20 Q. So notwithstanding the CCME work in
21 the communique relating to their continued efforts to
22 reduce CO(2) emissions, I just want it to be clear
23 then, Ontario Hydro's position is that it does not
24 anticipate any CO(2) regulations, new CO(2)
25 regulations; is that right?

1 A. Well, I can't speculate on that
2 really. At the time that this interrogatory was
3 responded to --

4 MR. B. CAMPBELL: Just a minute.

5 MR. BULLOCK: That's what I am getting
6 at.

7 MR. B. CAMPBELL: Mr. Chairman, aren't we
8 right back into exactly the same problem? I would have
9 thought that on Panel 8 CO(2) matters, CO(2) being a
10 function of fossil burning and not in any respect a
11 function of nuclear generation, would have been dealt
12 with. We had the right people to deal with these
13 questions on Panel 8 here at the time.

14 I think it is unfair to try and sneak it
15 in through the Nuclear Panel.

16 MR. BULLOCK: It is not sneaking in, Mr.
17 Campbell. If you would look at the interrogatory --
18 through you, Mr. Chairman, if you look at the
19 interrogatory reply had the witness panel been Fossil I
20 can assure you I would have been here asking the
21 questions to the Fossil panel, but it doesn't. It says
22 Nuclear Options Witness Panel, and, in fact, it says
23 that at tab 27 for Interrogatory 9.44.27; it says that
24 at tab 28 for Interrogatory 9.44.28 as well.

25 THE CHAIRMAN: Just explain to me why

1 CO(2) emission control is relevant to the nuclear
2 options--

3 MR. BULLOCK: Well, sir, if we look at
4 the paragraph --

5 THE CHAIRMAN: --other than the obvious
6 proposition that if you don't emit any CO(2) that is
7 better than having a control.

8 MR. BULLOCK: Yes, sir. It goes to the
9 question of obviously the appropriate mix of options.

10 THE CHAIRMAN: Well, that's not this
11 Panel. That's the next Panel.

12 MR. BULLOCK: With all due respect then,
13 sir, if my friend is content to provide me with an
14 update answer to Interrogatories 9.44.26, 9.44.27,
15 9.44.28--

16 THE REGISTRAR: Can we give those
17 numbers, Mr. Chairman?

18 THE CHAIRMAN: This is just a procedural
19 matter.

20 MR. BULLOCK: --prior to the next Panel,
21 Mr. Chairman, I am happy to leave that for Panel 10.

22 MR. B. CAMPBELL: Mr. Chairman, I don't
23 want to give any generalized undertaking like that.

24 What we did apparently in looking at
25 this, noting that they came from the Nuclear

1 Association and noting as well that the question
2 covered -- for instance, this question relates to gas
3 and particulate emissions to the atmosphere without
4 respect to any mention of fossil generation. There is
5 some discussion in the answer of both types. The
6 answer was provided well in advance of the -- I
7 believe.

8 MR. BULLOCK: Mr. Chairman, I --

9 MR. B. CAMPBELL: -- was provided in
10 advance of the Fossil Panel, and it was provided in
11 advance of the Nuclear Panel, and there were certain
12 matters that we spoke to on the Fossil Panel, and with
13 respect, there are certain matters that this Panel can
14 speak to, and, as I said, for all that it was given a
15 "9" number, in part because of where it comes from,
16 surely the contents can be easily discerned as to the
17 appropriate Panel which can speak to them.

18 MR. BULLOCK: Mr. Chairman, all I am
19 after is a current answer, and I am quite happy if my
20 friend would like me to resubmit them in the context of
21 Panel 10 and have them answered there. They were
22 posed, they were answered. All I want to ensure is
23 that they --

24 THE CHAIRMAN: Are you satisfied they
25 weren't dealt with on Panel 8?

1 MR. BULLOCK: I am satisfied that they
2 were not dealt with in Panel 8?

3 MR. B. CAMPBELL: Those issues.

4 THE CHAIRMAN: As to whether or not the
5 anticipated CO(2) regulations by Hydro...

6 MR. BULLOCK: I have not had the
7 opportunity to review the Panel transcript, sir. I
8 have reviewed the exhibits.

9 THE CHAIRMAN: My guess is they were
10 dealt with in that Panel.

11 MR. BULLOCK: Without reviewing the
12 transcript I can't agree with that proposition, but I
13 am happy, sir, to move on if my friend will undertake
14 to confirm that the answers to those interrogatories,
15 9.44.26 to 9.44.28, inclusive, are accurate. All I am
16 after is current information.

17 MR. B. CAMPBELL: The interrogatory
18 answer is dated February 13th. Looks pretty current to
19 me.

20 Obviously, though, I would be astounded
21 if there hadn't been some discussion of CO(2) matters
22 on Panel 8. I am sure there must have been. I did not
23 attend every day.

24 THE CHAIRMAN: Well, my recollection was
25 that this was dealt with, but I wouldn't want to trust

1 it completely. But Hydro's anticipation of CO(2)
2 controls in the future was certainly a matter that was
3 alluded to on Panel 8.

4 You are quite right, of course, that you
5 can ask Mr. Johansen, but it is not really fair to put
6 him in that kind of a position when these answers have
7 been given by Hydro on --

8 MR. BULLOCK: All I am looking for, sir,
9 is current information and certainly --

10 THE CHAIRMAN: Perhaps you could review
11 Panel 8 and see if you have got any problems after
12 that --

13 MR. BULLOCK: I can certainly do that. I
14 can certainly do that.

15 Q. Mr. King, perhaps we could move on to
16 you, then. Thank you, Mr. Johansen.

17 There is simply some information with
18 respect to the interrogatories that I would like to
19 have you confirm, and if we could start, sir, with the
20 safety information contained at tab 15, Interrogatory
21 9.44.15.

22 THE REGISTRAR: .53.

23 ---EXHIBIT NO. 520.53: Interrogatory No. 9.44.15.

24 MR. BULLOCK: Q. Could you simply
25 confirm that that is an accurate summary today, Mr.

1 King, with respecting the principal safety design
2 features of the Darlington station?

3 MR. KING: A. You will have to give me a
4 minute to read it.

5 Q. Certainly.

6 A. Okay. I have read it. The middle
7 paragraph there, the third sentence: There are three
8 special safety systems. That should have been four.
9 Each shutdown system is considered a separate safety
10 system.

11 Q. On that?

12 A. And in the last paragraph I cannot
13 confirm that that is the amount of water, that
14 six-eight-two-oh figure. It is a large amount.
15 Whether it is that, I don't know.

16 But otherwise, I think the information in
17 the response is accurate.

18 Q. All right. With respect to the
19 amount of natural water available I take it that in
20 your view it is an adequate amount for the safe
21 operation of the system; is that fair?

22 A. The amount that we have at Darlington
23 is. What I am saying is I just don't keep numbers like
24 that in my head, so...

25 Q. Perhaps you could check that and

1 advise us tomorrow morning if there is a --

2 A. I will accept it as correct, subject
3 to check.

4 Q. Unless you advise otherwise, that's
5 fine.

6 THE CHAIRMAN: I am not sure I followed
7 you. You said there were four systems instead of
8 three, and then you referred to the three that are in
9 that sense. What's the fourth?

10 MR. KING: Mr. Chairman --

11 THE CHAIRMAN: I only see three systems
12 in that sentence.

13 MR. KING: The shutdown systems, there is
14 two shutdown systems.

15 THE CHAIRMAN: All right.

16 MR. KING: Shutdown system No. 1,
17 shutdown system No. 2.

18 THE CHAIRMAN: I understand.

19 MR. BULLOCK: Q. There is the rod drop
20 and the poisoning out systems, are there not, Mr. King?

21 MR. KING: A. Yes.

22 Q. Could I take you to tab 16, sir,
23 please, Interrogatory 9.44.16?

24 THE REGISTRAR: .54.

25 ---EXHIBIT NO. 520.54: Interrogatory No. 9.44.16.

1 MR. BULLOCK: Q. That deals with
2 external safety reviews. Could you just confirm that
3 that information remains accurate, Mr. King? I believe
4 it does.

5 MR. KING: A. Yes, I have read that.
6 The reference is to the Select Committee. The IEA
7 OSART program, and the Ontario Nuclear Safety Review,
8 the conclusions were all references I used in my
9 evidence in chief, and I can confirm that that is
10 accurate.

11 The Royal Commission on Electric Power
12 Planning, the quote there, I believe it to be accurate,
13 but I must admit I haven't checked that those are the
14 exact words. But I will accept it.

15 Q. So you will take it as accurate,
16 subject to checking?

17 A. Yes.

18 Q. That's fine. Could we move on to tab
19 20, please? Tab 20, question 9, Interrogatory 9.44.20.

20 THE REGISTRAR: .55.

21 ---EXHIBIT NO. 520.55: Interrogatory No. 9.44.20.

22 MR. BULLOCK: Q. Now, with respect to
23 the public that is, Mr. King, have there been any
24 accidents at Ontario Hydro's nuclear facilities which
25 have resulted in radiation releases exceeding

1 regulatory limits? The answer is no, there haven't
2 been any.

3 That is correct, is it not, for the
4 public?

5 MR. KING: A. Yes. That's correct.

6 Q. Could we move on to tab 22, please?

7 THE CHAIRMAN: What's the significance in
8 your view of putting the word "public" in?

9 MR. BULLOCK: I believe, Mr. Chairman,
10 that there have been some instances involving the
11 workers at nuclear facilities. I think Dr. Whillans
12 mentioned it.

13 Q. There were a couple of instances
14 where the workers had been exposed to more than the
15 legal limit in individual cases. Was that not correct?

16 DR. WHILLANS: A. I think I referred to
17 18 over the history of our nuclear program.

18 Q. Right. And I think the rest of the
19 evidence on that point was that there had been 16
20 incidents in 1990 for out-of-province utilities, and,
21 in fact, two of those were dental hygienists, wasn't
22 that right, for 1990?

23 A. That sounds about right. I'm not
24 sure about the number 16.

25 MR. BULLOCK: That's the significance,

1 Mr. Chairman.

2 THE CHAIRMAN: All right.

3 MR. BULLOCK: Q. Tab 22, Mr. King,
4 Interrogatory 9.44.22, Mr. Lucas.

5 THE REGISTRAR: .56.

6 ---EXHIBIT NO. 520.56: Interrogatory No. 9.44.22.

7 MR. BULLOCK: Q. Now, that deals with
8 fatality and lost time injury rates. Mr. King, would
9 you be familiar with those or would that be perhaps Mr.
10 Johansen or Dr. Whillans'--

11 MR. KING: A. I believe it's Dr.
12 Whillans.

13 Q. --information?

14 DR. WHILLANS: A. Sorry, I didn't hear
15 which tab you were at.

16 Q. 22.

17 A. 22.

18 Q. Interrogatory 9.44.22. It deals with
19 fatality and lost time injury rates, Dr. Whillans?

20 A. Yes.

21 Q. Could you just confirm that that
22 information is accurate and correct?

23 [4:48 p.m.]

24 A. I believe that's correct, yes.

25 Q. All right. And what the information

1 shows then, its significance, Dr. Whillans, is that
2 with respect to operations it shows that nuclear
3 stations have faired better than fossil stations, and
4 with respect to operations both are better than the
5 utility average shown there, second last paragraph;
6 Isn't that right?

7 A. That's correct.

8 Q. In other words, it's an indicia of
9 the safety of nuclear and indeed fossil operations; is
10 it not?

11 A. That's correct.

12 Q. And with respect to the construction
13 figures, again, it shows that both nuclear and fossil
14 are better than the Ontario construction industry
15 averages; does it not?

16 A. Yes, it does.

17 Q. And, again, that's an indicia of the
18 safety of both nuclear and fossil?

19 A. Yes.

20 Q. Is that correct?

21 A. Yes.

22 Q. All right. Could I take you to tab
23 24, please, gentlemen, interrogatory 9.44.24.

24 THE REGISTRAR: .57.

25 ---EXHIBIT NO. 520.57: Interrogatory No. 9.44.24.

1 MR. BULLOCK: Q. Now, that deals with
2 risk studies, and I'm particularly interested in the
3 second paragraph:

4 Ontario Hydro is currently
5 reviewing the health impacts of the
6 nuclear and fossil fuel cycles. The
7 results of those reviews will be made
8 available to the Board and the
9 intervenors when they are completed and
10 the resulting documentation is approved.

11 I take it, gentlemen, that for the
12 nuclear that would be Exhibit 507; is that right?

13 DR. WHILLANS: A. I believe so.

14 Q. That's what's referred to there.
15 There isn't some other review that we haven't received;
16 is there? I thought -- I took it to be Exhibit 507.

17 A. Not that I now of.

18 Q. And with respect to the fossil, I
19 took it to be Exhibit 468; is that right? I believe
20 that's the report that deals with fossil...

21 MR. B. CAMPBELL: That's correct.

22 MR. BULLOCK: Q. And, Dr. Whillans, to
23 your knowledge or to the knowledge of any of the other
24 gentlemen on the panel, are there any reports
25 forthcoming with respect to alternative options

1 mentioned in the update, demand management, NUGs,
2 things of that nature, are there any health reports
3 forthcoming for those?

4 DR. WHILLANS: A. I don't know.

5 Q. Okay. Could I take you to tab 30,
6 please, and I suspect, Mr. King, this may be yours or
7 perhaps Mr. Daly. Question interrogatory 9.44.30.

8 THE REGISTRAR: .58.

9 ---EXHIBIT NO. 520.58: Interrogatory No. 9.44.30.

10 MR. BULLOCK: Q. Deals with quality
11 assurance programs for nuclear facilities. Would that
12 be you Mr. King or Mr. Daly?

13 MR. KING: A. All depends what your
14 question is.

15 Q. I want to confirm that the
16 information is current and correct.

17 A. To my knowledge it is correct. I'll
18 ask Mr. Daly to comment.

19 MR. DALY: A. Yes, I can confirm that
20 it's correct also.

21 Q. All right. And Mr. Daly or Mr. King,
22 perhaps you could just help me with the last sentence,
23 the last three lines comparing quality assurance
24 programs for the nuclear facilities and other
25 facilities, the sentence commencing:

1 The programs do not necessarily
2 establish documented evidence.

3 Is it fair to say that nuclear has the
4 most stringent quality assurance programs?

5 MR. KING: A. Well, I can confirm that
6 nuclear has stringent quality assurance programs.

7 Q. Is it fair to say, Mr. King, that the
8 documentation generated for the nuclear programs is
9 significantly greater than that generated by the
10 quality assurance programs for other options?

11 A. I can confirm there is a lot of
12 documentation for the nuclear program.

13 Q. Thank you very much, sir. Perhaps we
14 could move on.

15 MR. PENN: A. The answer is, we haven't
16 built any fossil plant for quite a while so all our
17 quality assurance documents are really nuclear.

18 Q. Thank you, Mr. Penn.

19 MR. BULLOCK: I expect, Mr. Chairman, I
20 will be no more than another perhaps 40 minutes, and
21 I'm happy to break until tomorrow.

22 I have a couple of questions about
23 unavailability for Mr. King and a couple of final
24 questions after that, and then I'll be definitely less
25 an hour, sir, perhaps 40 minutes.

1 THE CHAIRMAN: All right. We will break
2 then until tomorrow morning at ten o'clock.

3 MR. BULLOCK: Very good.

4 THE REGISTRAR: This hearing will adjourn
5 until tomorrow morning at ten o'clock.

6 ---Whereupon the hearing was adjourned at 4:58 p.m., to
7 be reconvened on Tuesday, the 7th day of April,
1992, commencing at 10:00 a.m.



